Converting Car Alternator Into a Permanent Magnet Brushless Motor

by DIY KING 00

//www.youtube.com/embed/aV6kLTqS8YE

12v alternators! they are robust, powerful and you can find them everywhere, even under the hood of your car. Well the only thing they lack is efficiency and that's because the way they are designed.

In this instructable we are going to see weather we can repurposed a 12v car alternator into a generator or a powerful brushless motor. So time to get our hands dirty.

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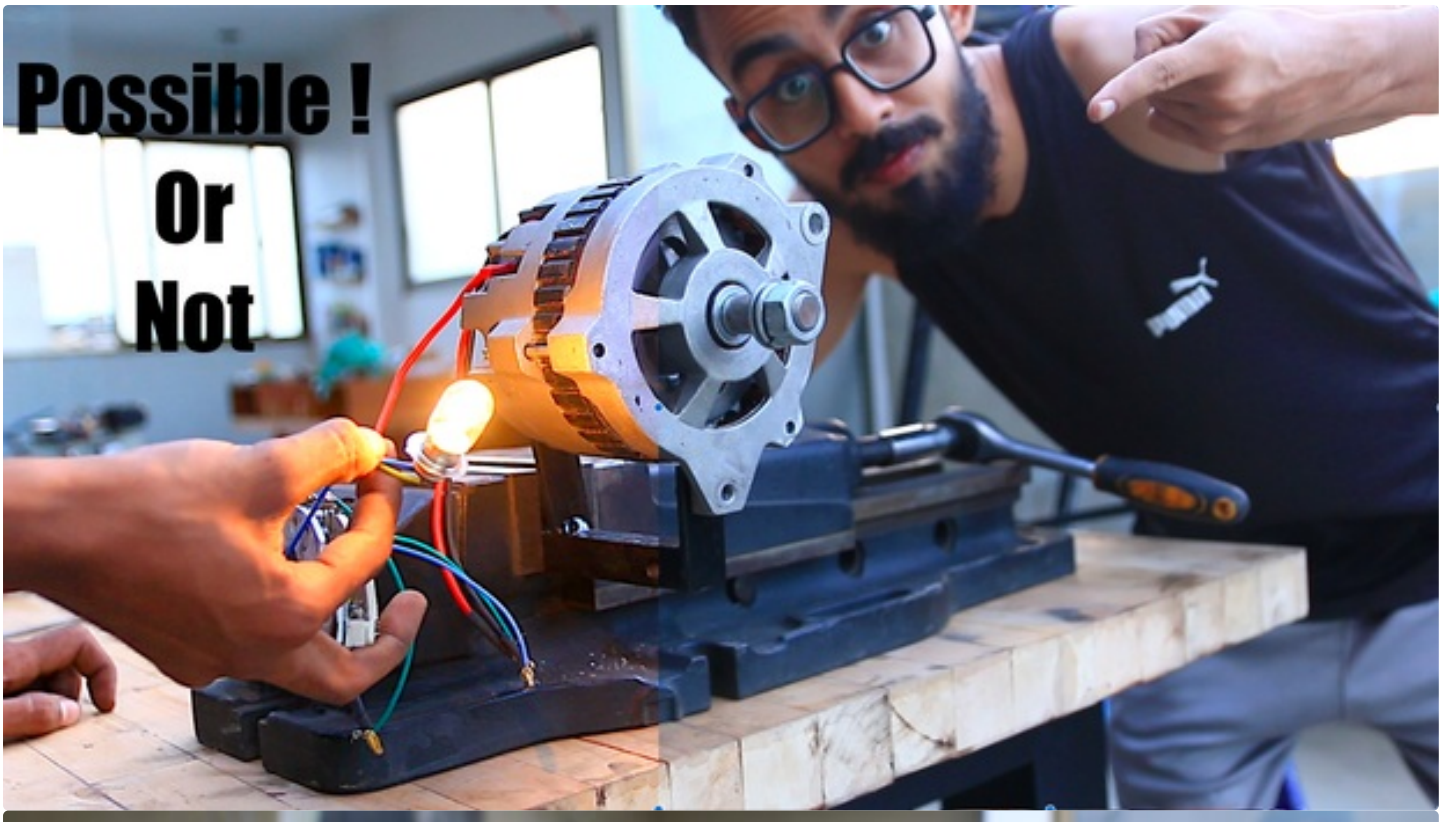
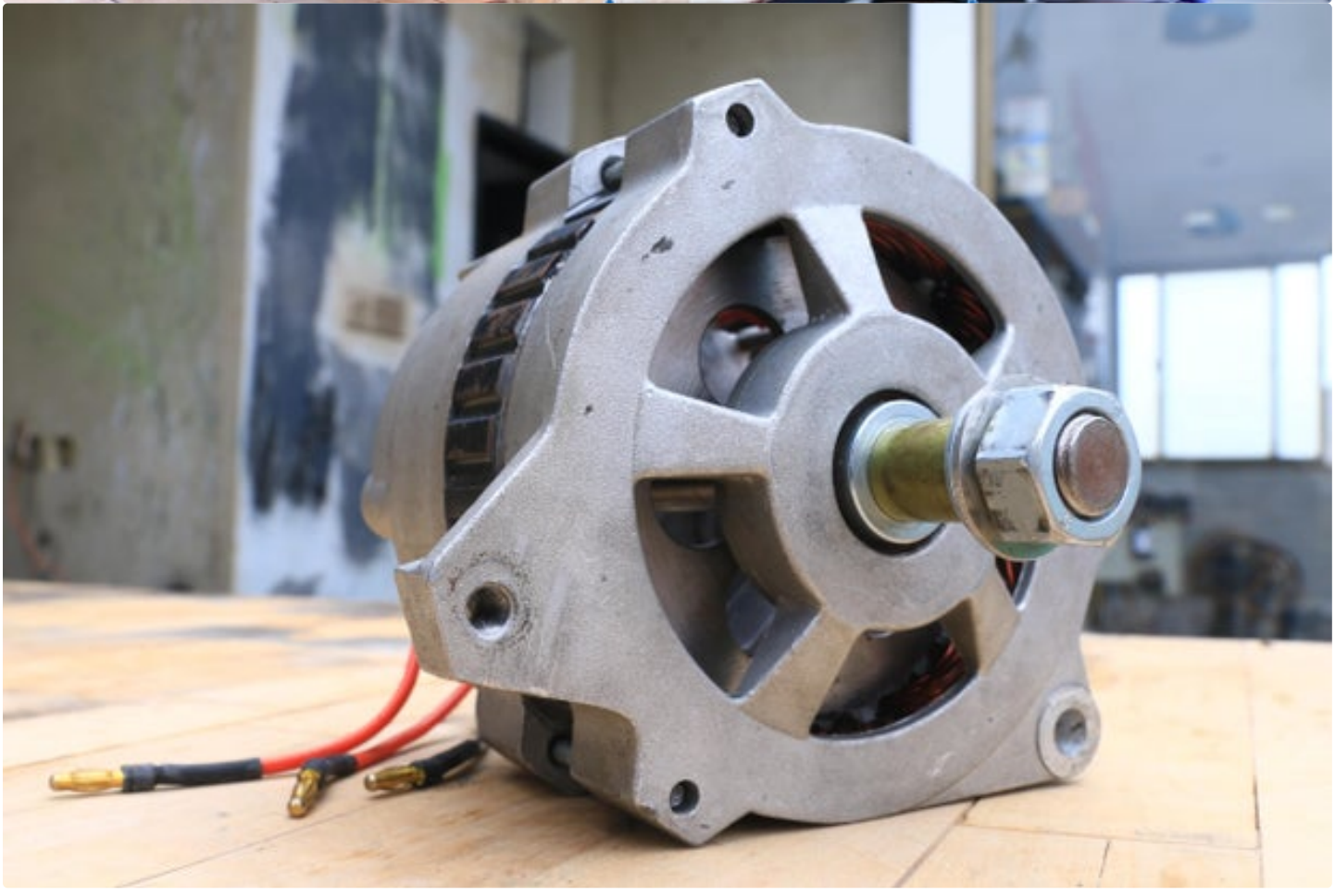
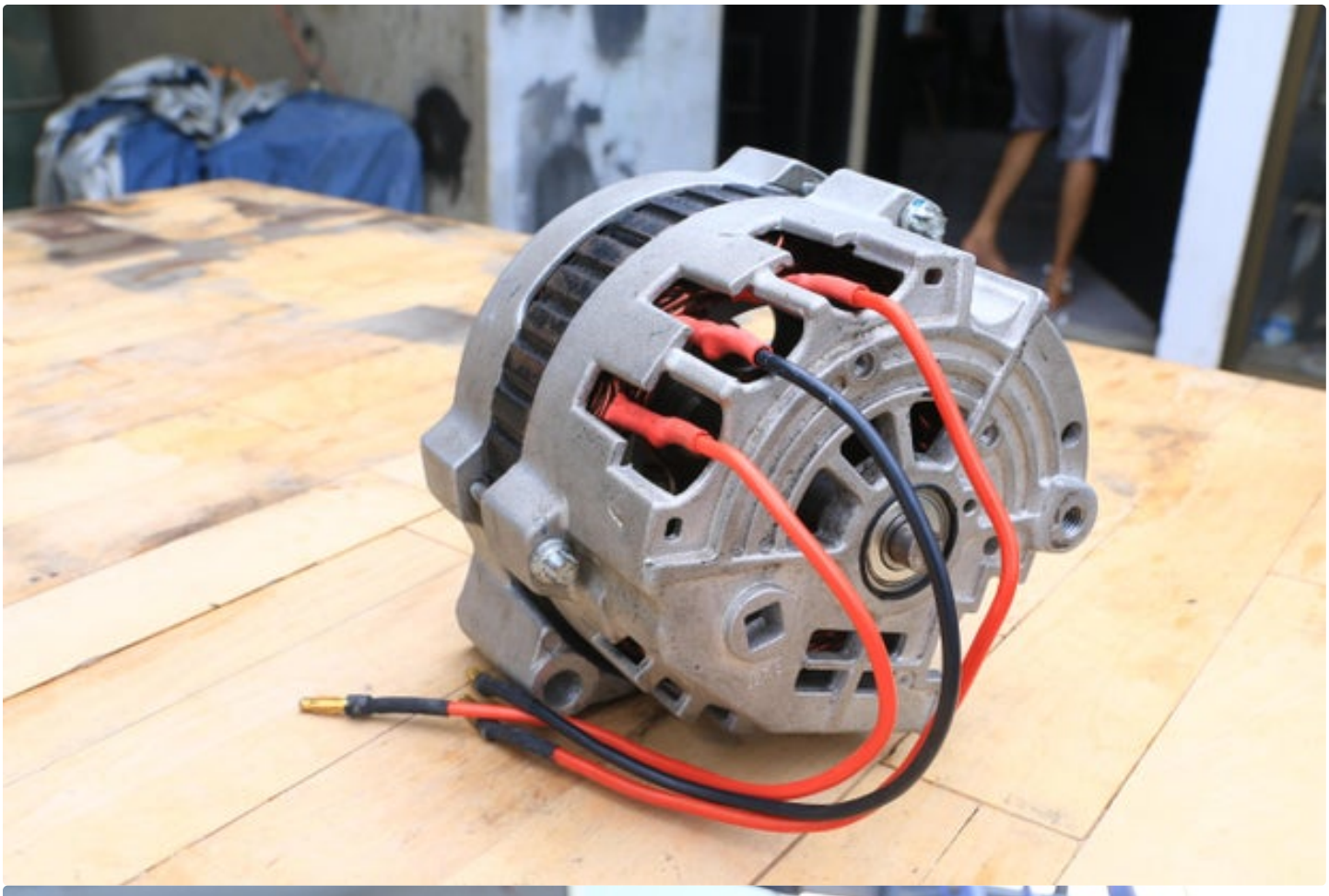
Supplies:

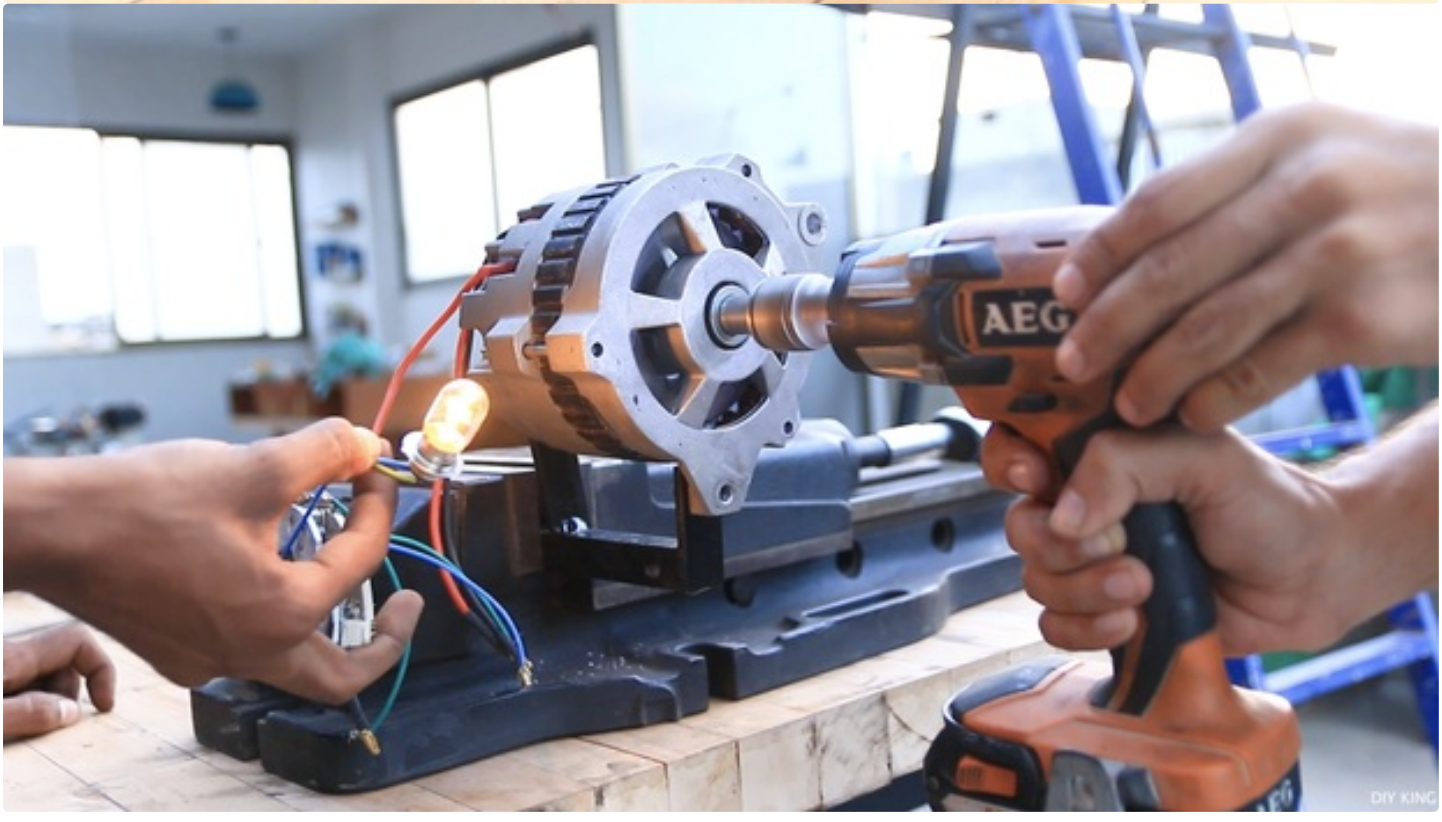
For this project you are going to need the following material and tools:

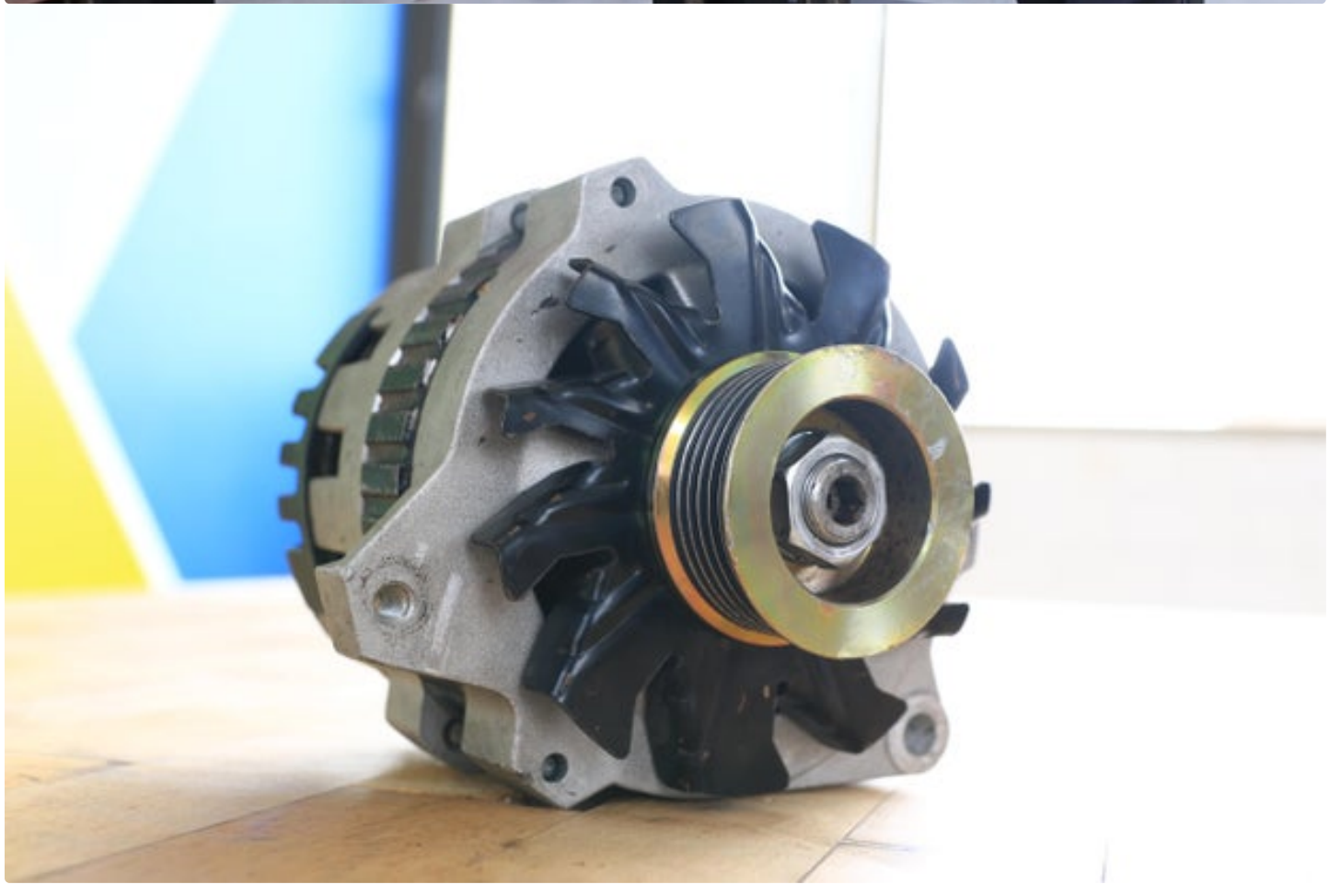
- A 12v car alternator
- Neodymium magnets
- 10 gauge wires
- 4mm bullet connectors
- A metal rod , metal disc and a drum to custom built the rotor.
- Acess to lathe machine
- Drill press
- Angle Grinder
- Drill bits
- Soldering tools
- Hand tools
- A 12v Bulb
- Brushless speedcontroller
- Super glue.etc.







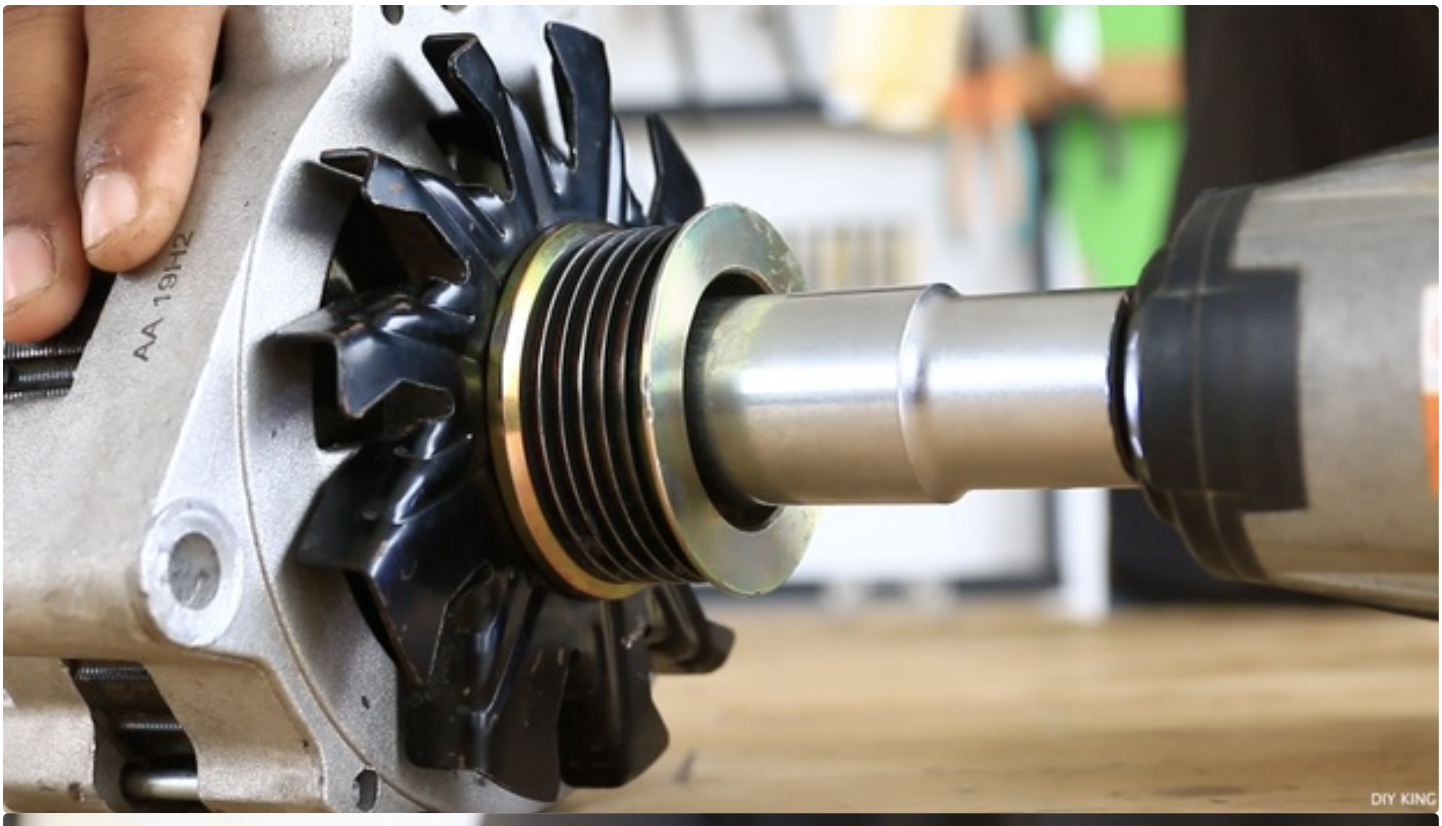


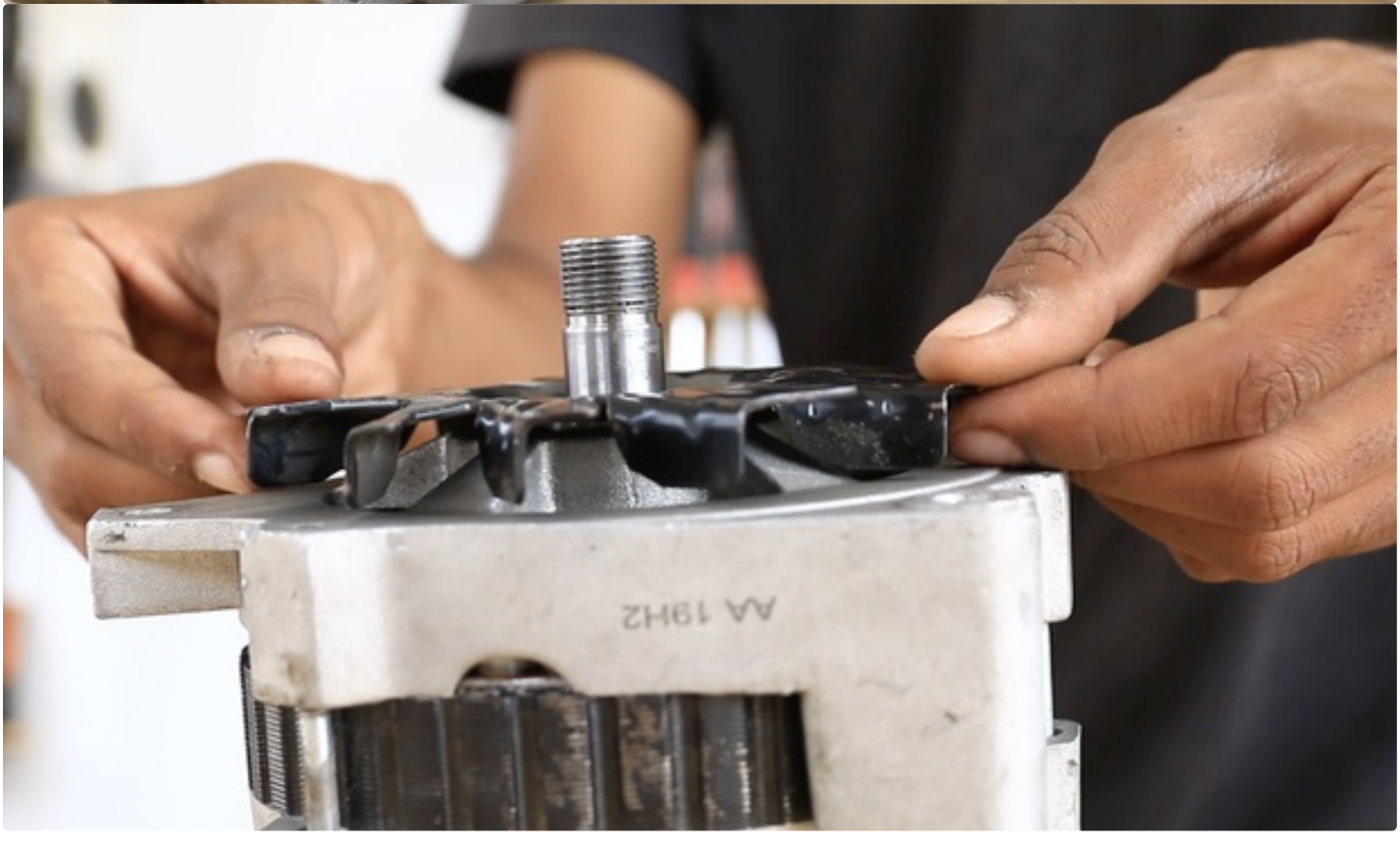


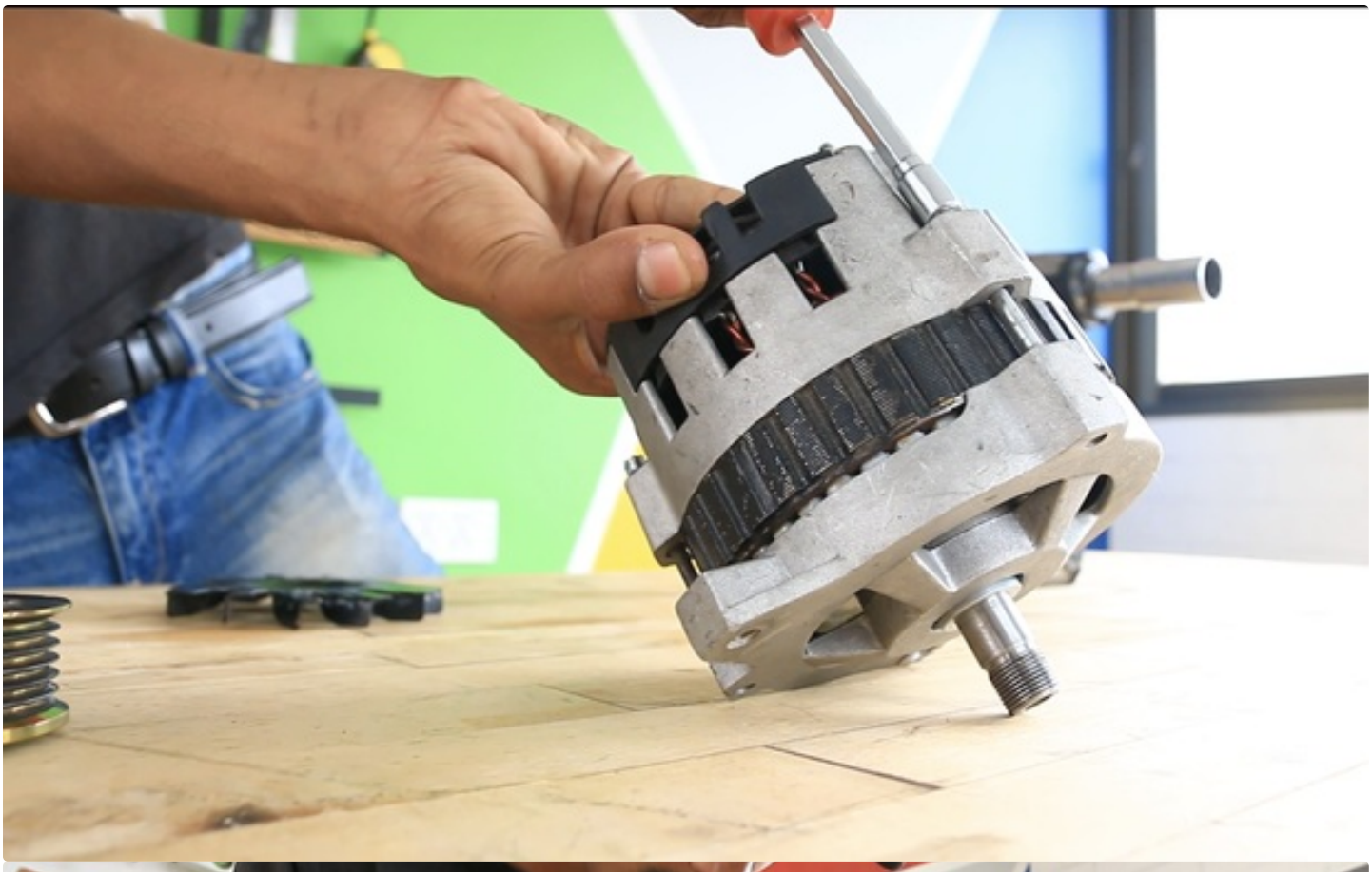
Step 1: Disassembling the Alternator

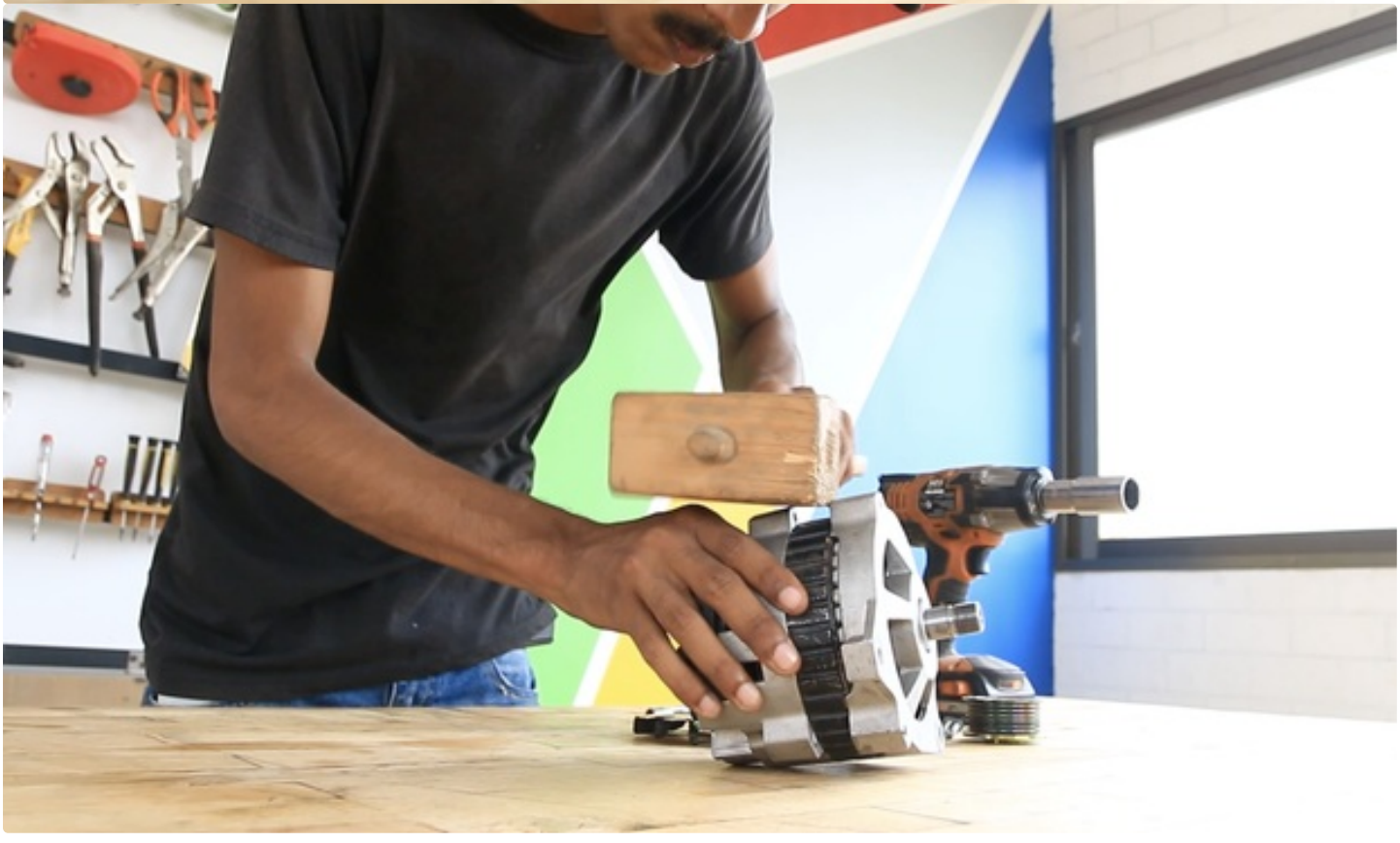
For this conversion we have got a 12v car alternator. These alternators converts the mechanical energy of an internal cumbustion engine to top up the battery as it powers the onboard electrical acessories. The fact that they are attached to a fuel sucker makes the design of these alternators justified, inefficient yet robust, I mean who cares abou the efficiency when you have plenty of power to loose. Most of the alternators have thick stator laminations like this one resulting in excessive eddy currents resulting less efficiency, well we cant change anything about the stator as the whole unit is based arround that, but if we look into the rotor there are a bunch of changes that we can do to make this thing usefull.

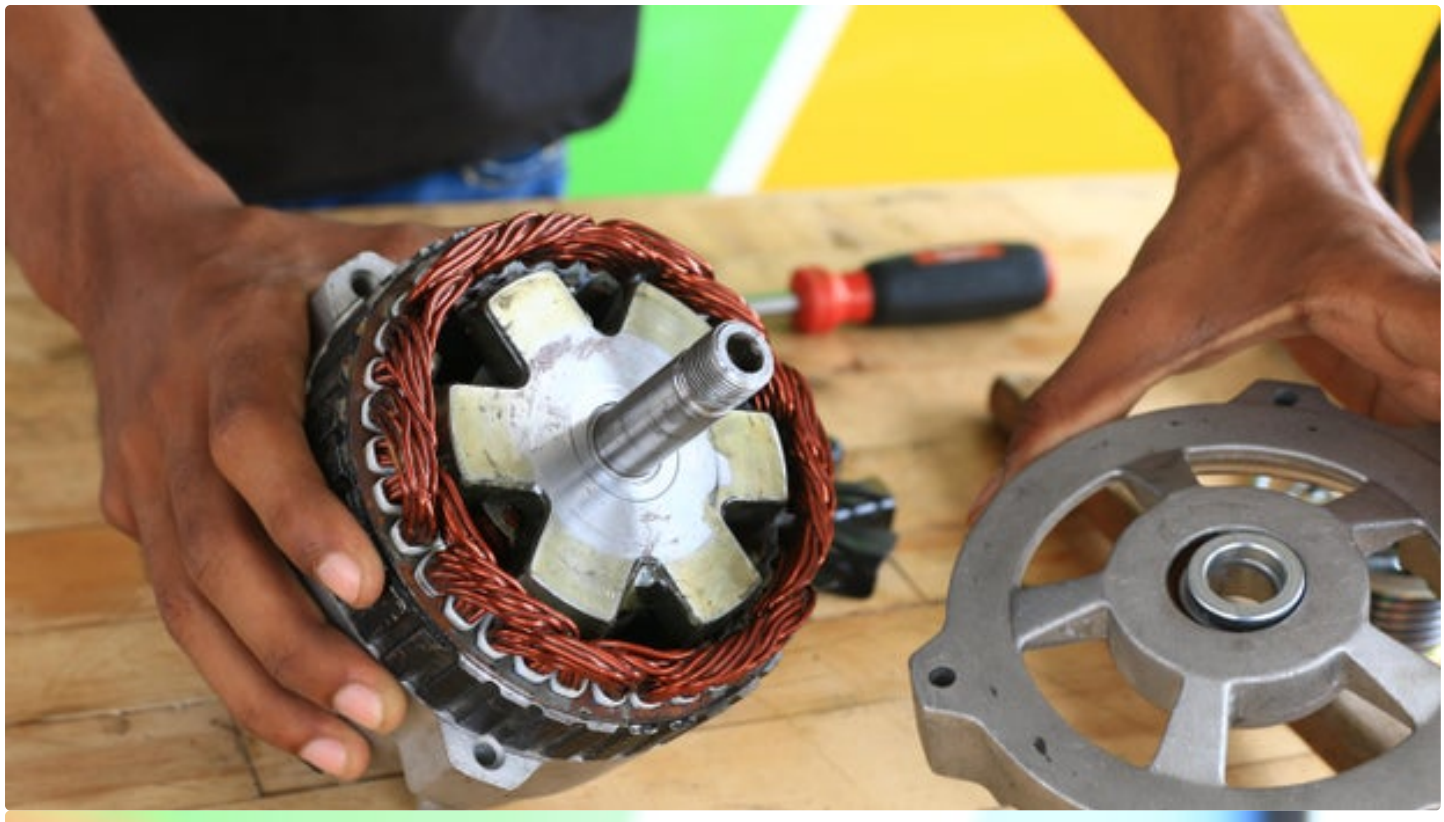
You might be thinking why they have used three inefficient components if they can generate more power just by using a permanent magnet rotor. Well the limitation here is the engine speed, we cannot control it yet we need to produce a fixed voltage otherwise we will end up blowing up everything. Now thats achieved using a regulator that decreases the voltage applied across the rotor coil through a pair of carbon brushes as the engine speeds up. Another reason for this is the fact that permanent magnets will loose their strength under the temperatures these alternators usually operates, making them expensive and less reliable which surely car companies dont want.

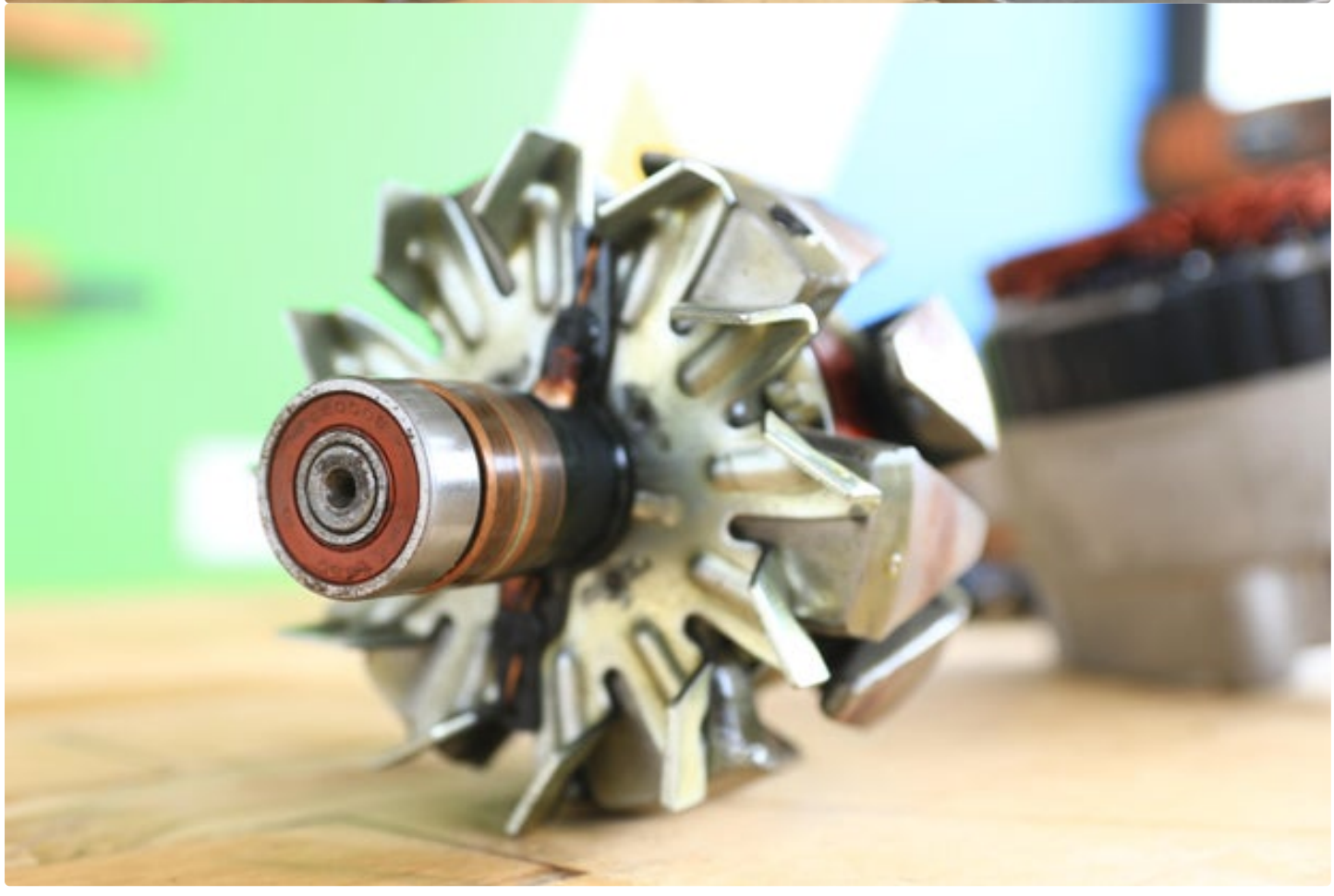


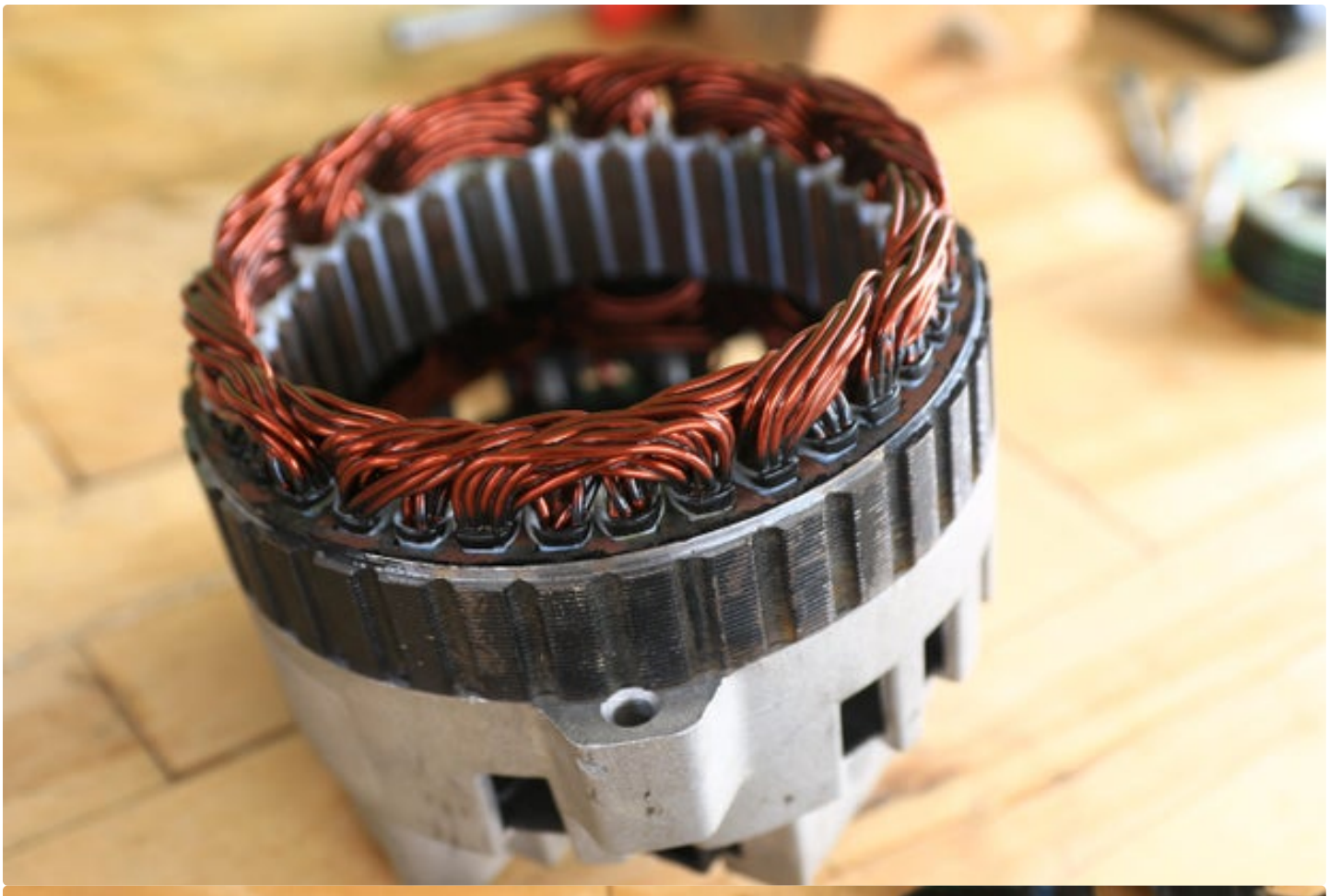


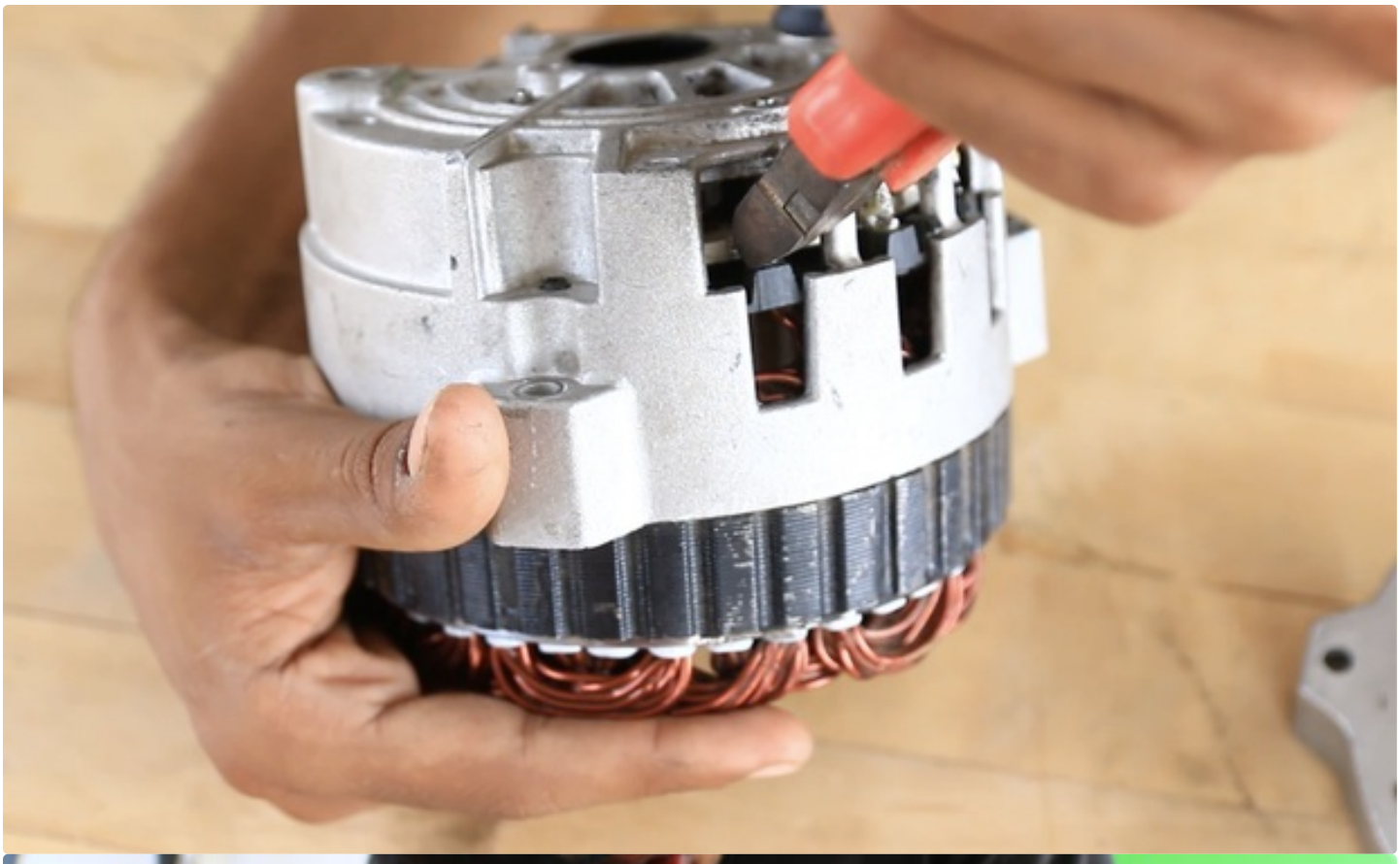


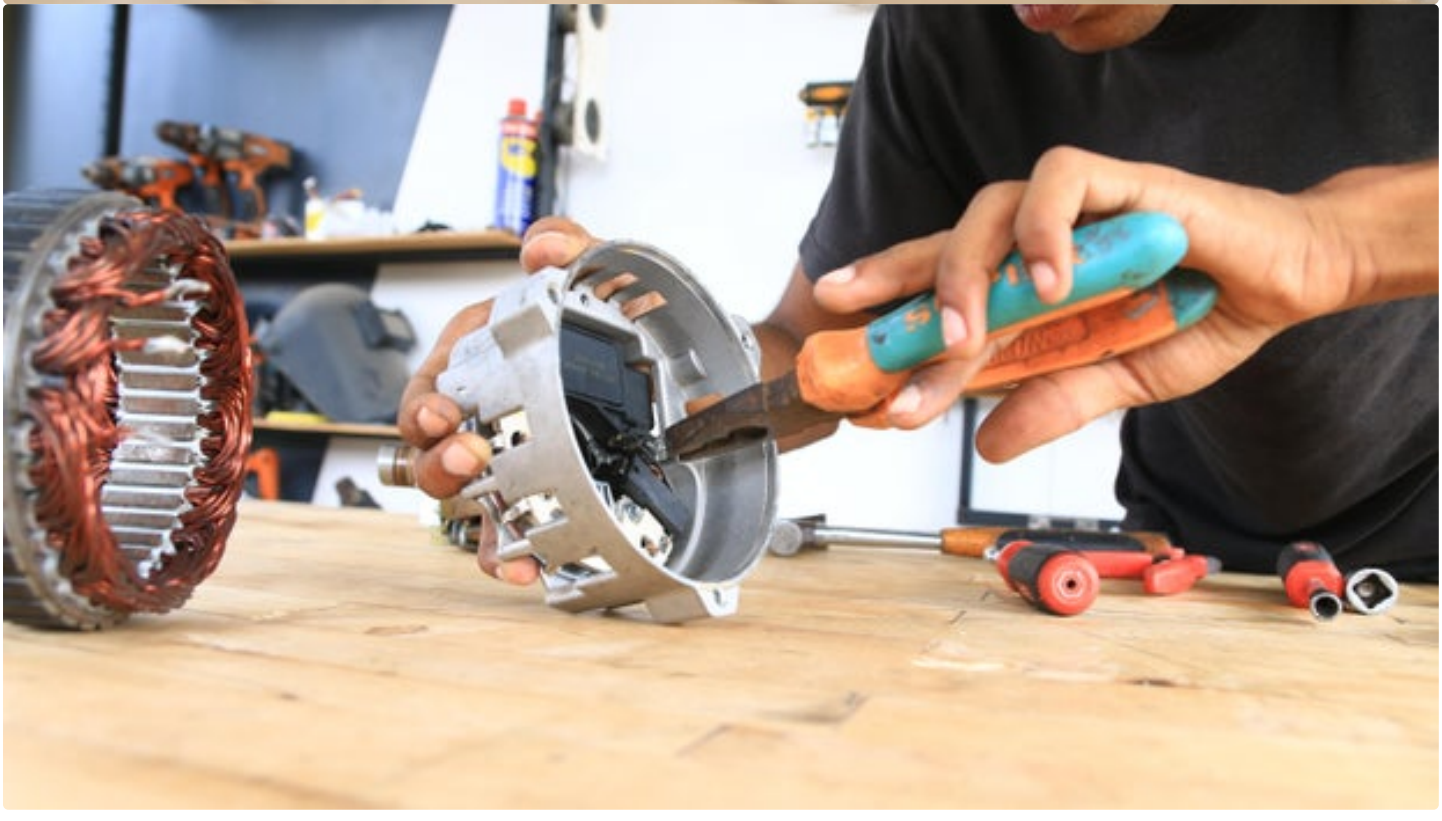


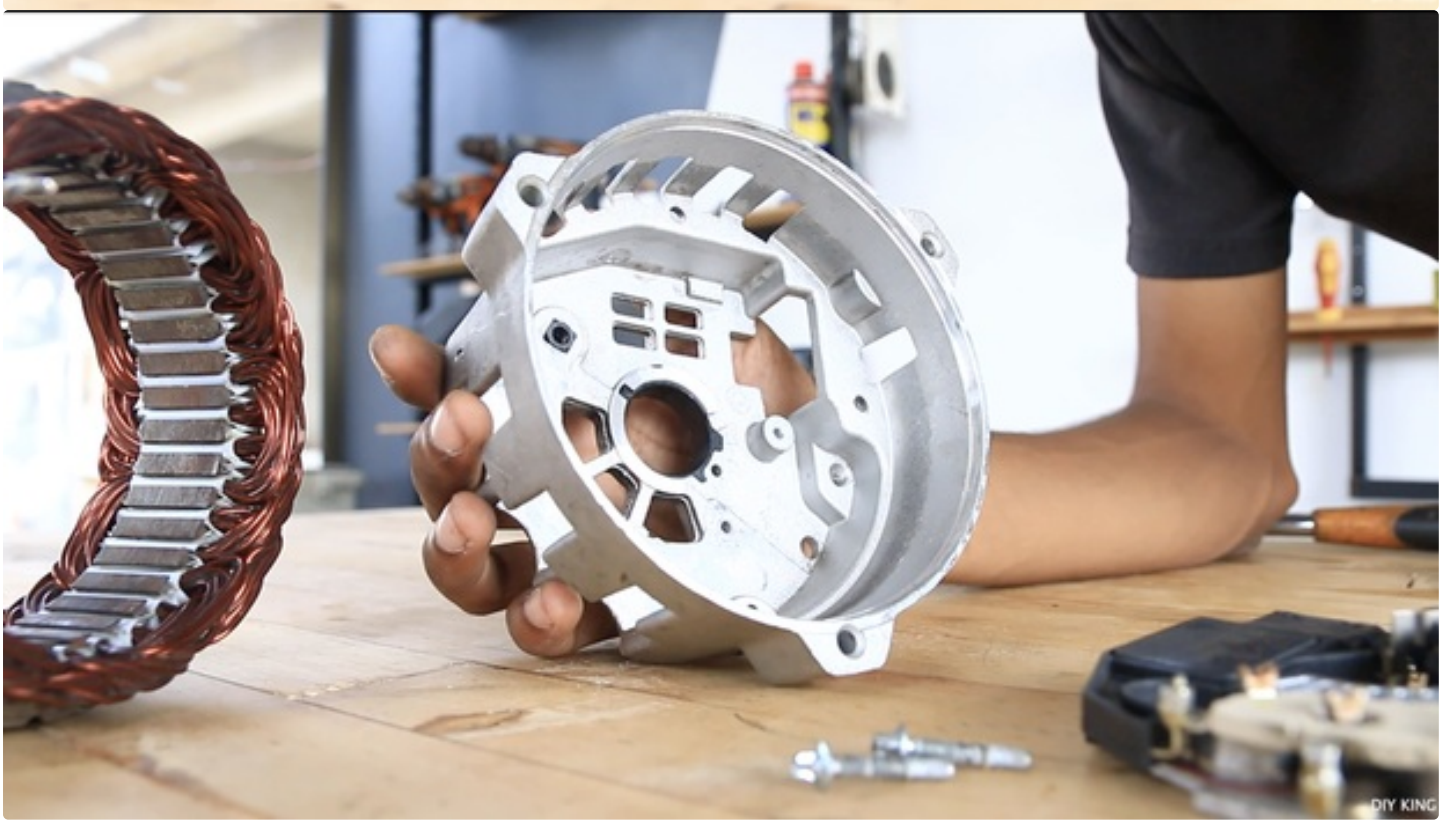










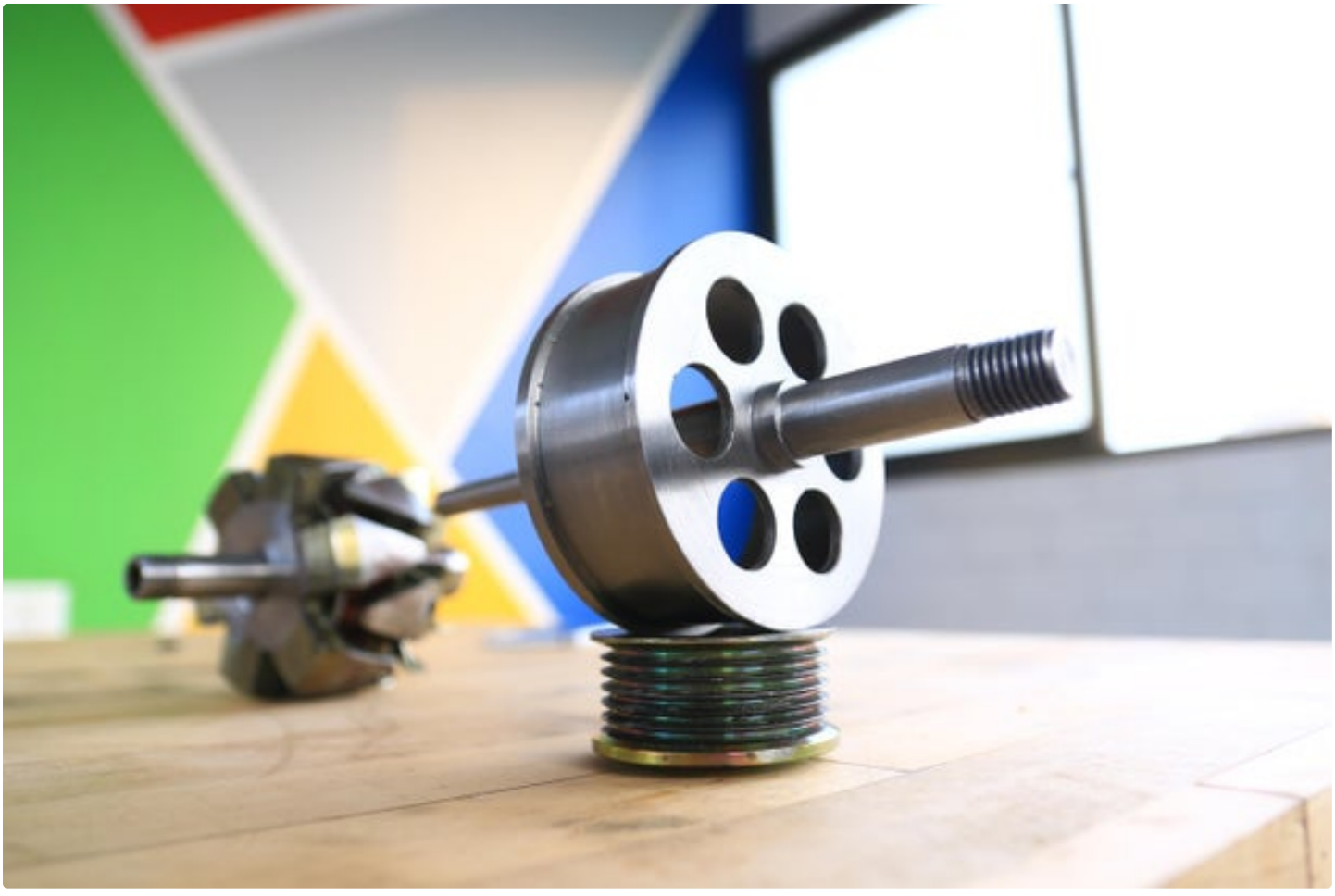


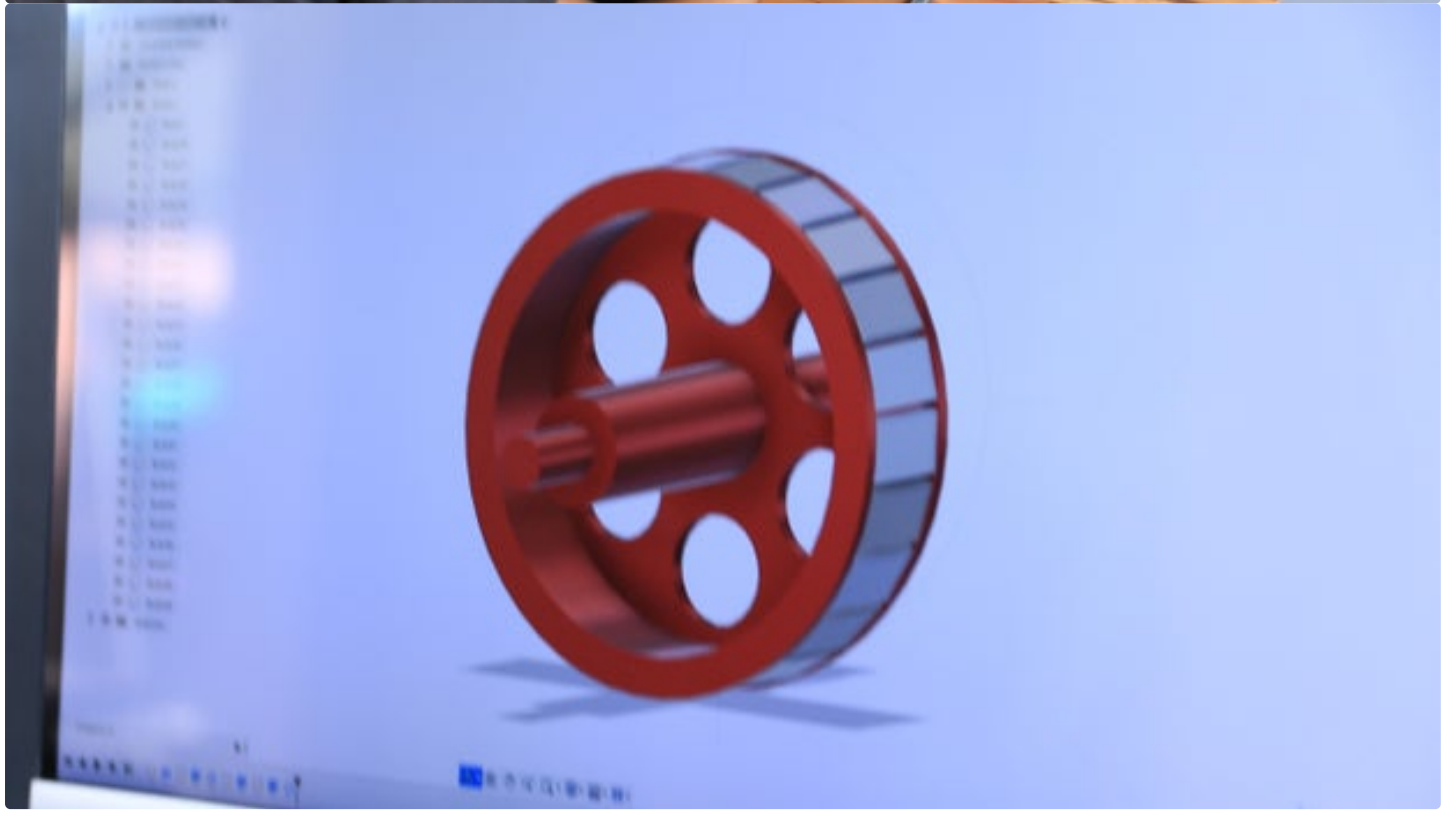
Step 2: Making the Permanent Magnet Rotor

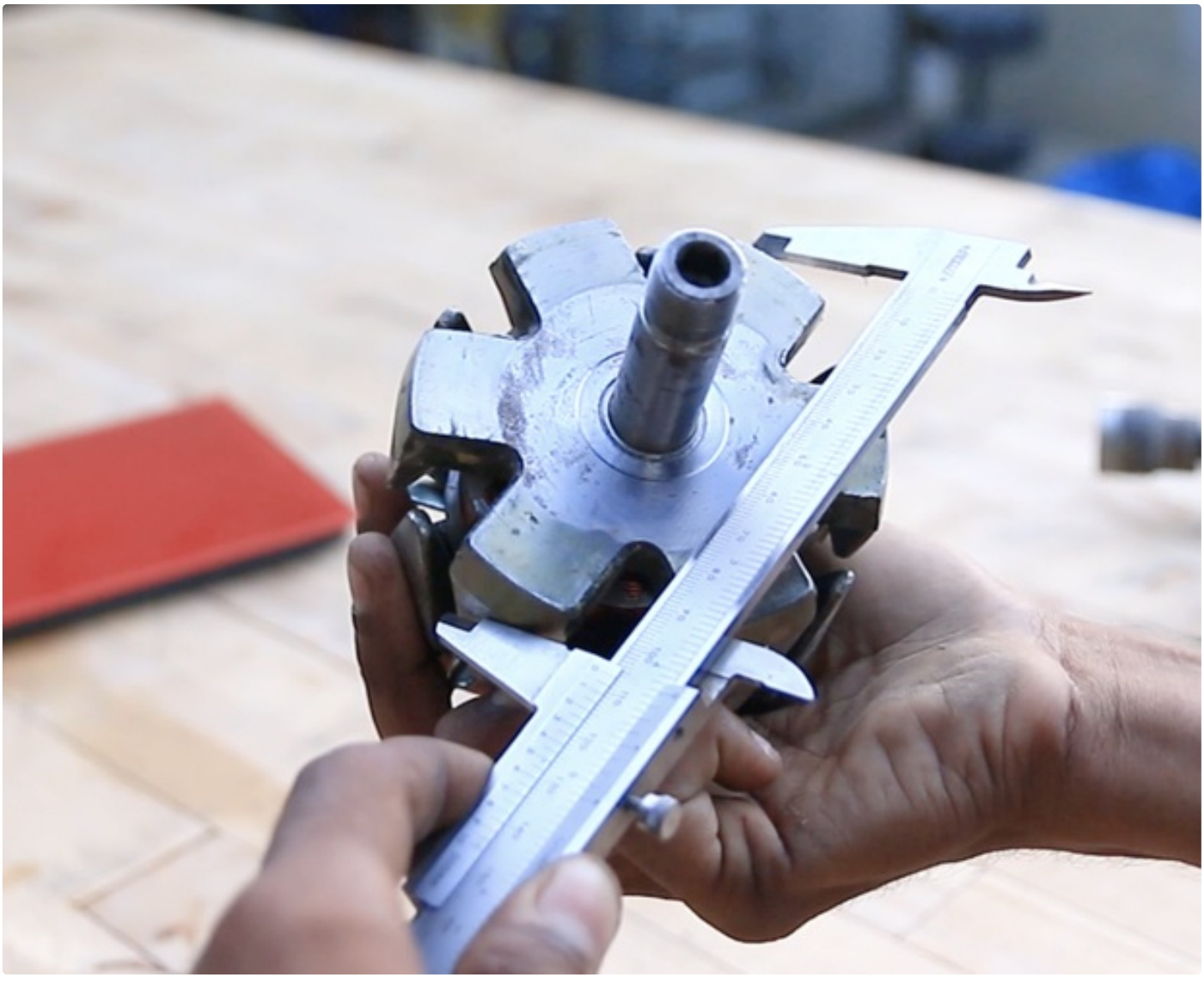
As everything is apart, we took the dimensions like the rotor diameter and the height of the stator coils to determine the size of magnets that we are going to need. Thankfully the neodymium magnets we needed were exactly the same thats used in a brushless hub motor in a hoverboard. We have got a bunch of them laying arround so we poured one of the

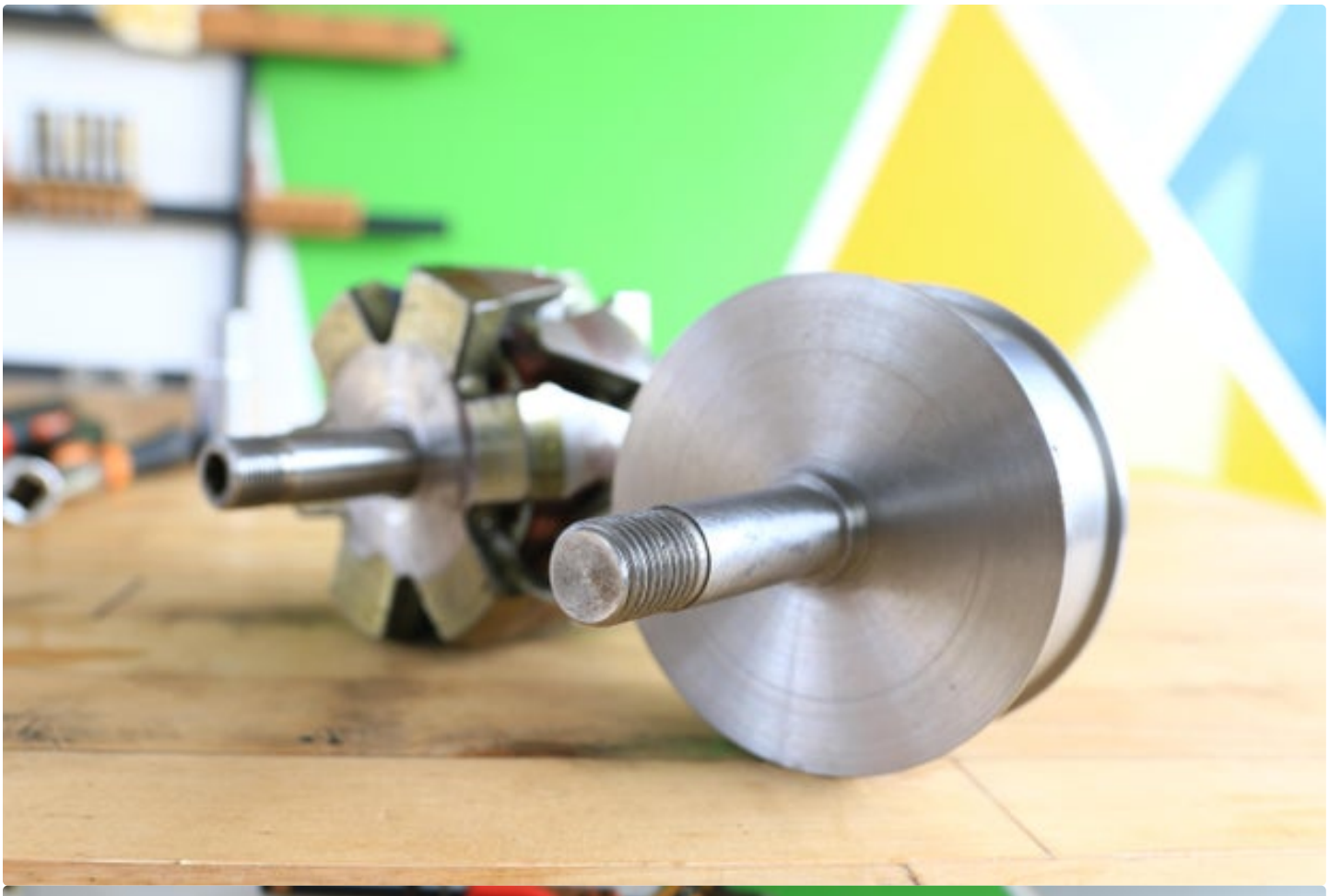
hubs with thinner to let the glue soften, this will later help us to salvage the magnets.

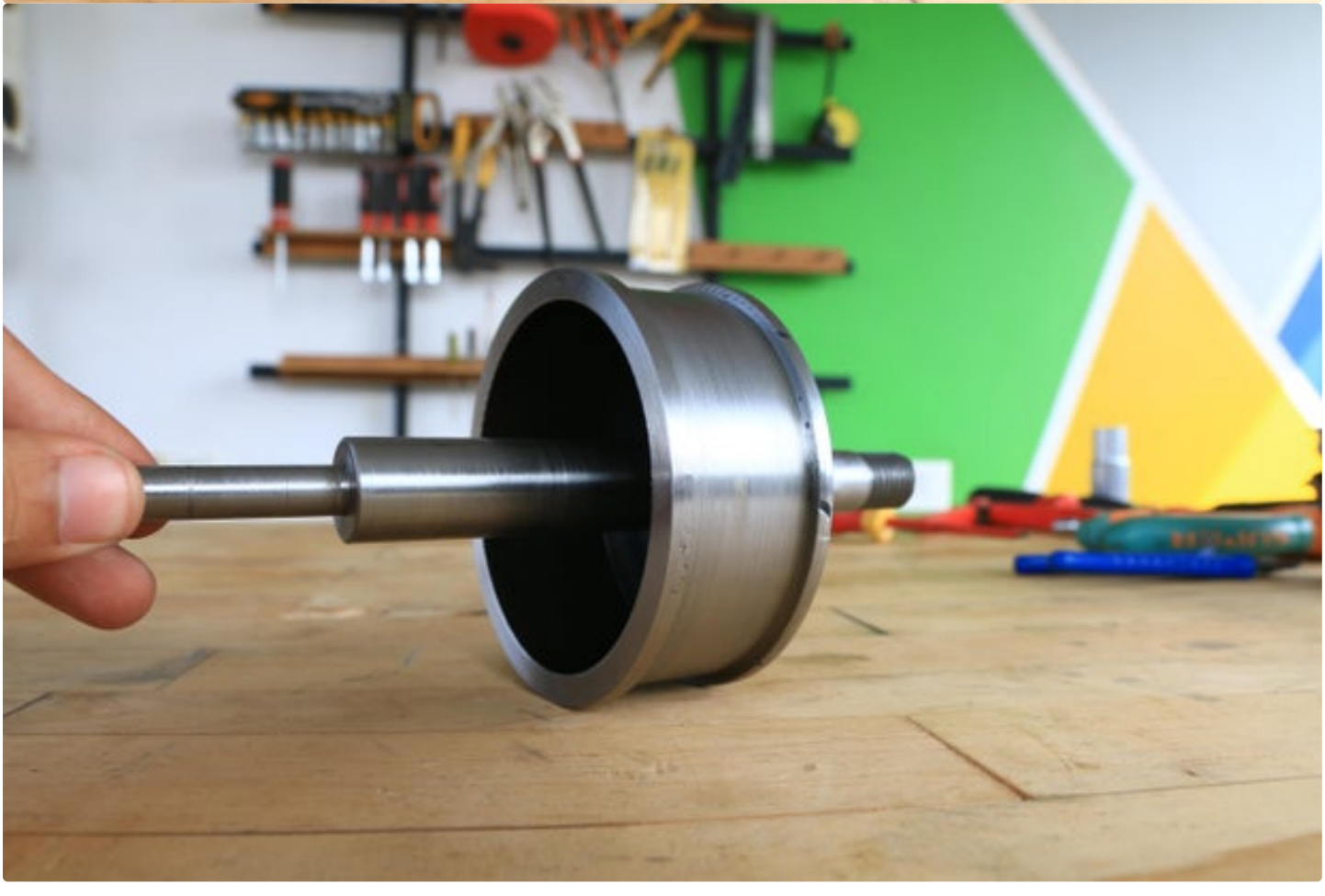
Once we finalized the rotor design we outsourced the machining and here it is, A job welldone. We have got a 17mm shaft to which the face plate and the drum is welded and later machined down to the required size. We have got 3mm collars on either ends of the drum that will later help us allign the magnets vertically on the drum. To further cut down weight we drilled six holes on the rotor face plate that will allow the air to flow across making everything cooler.

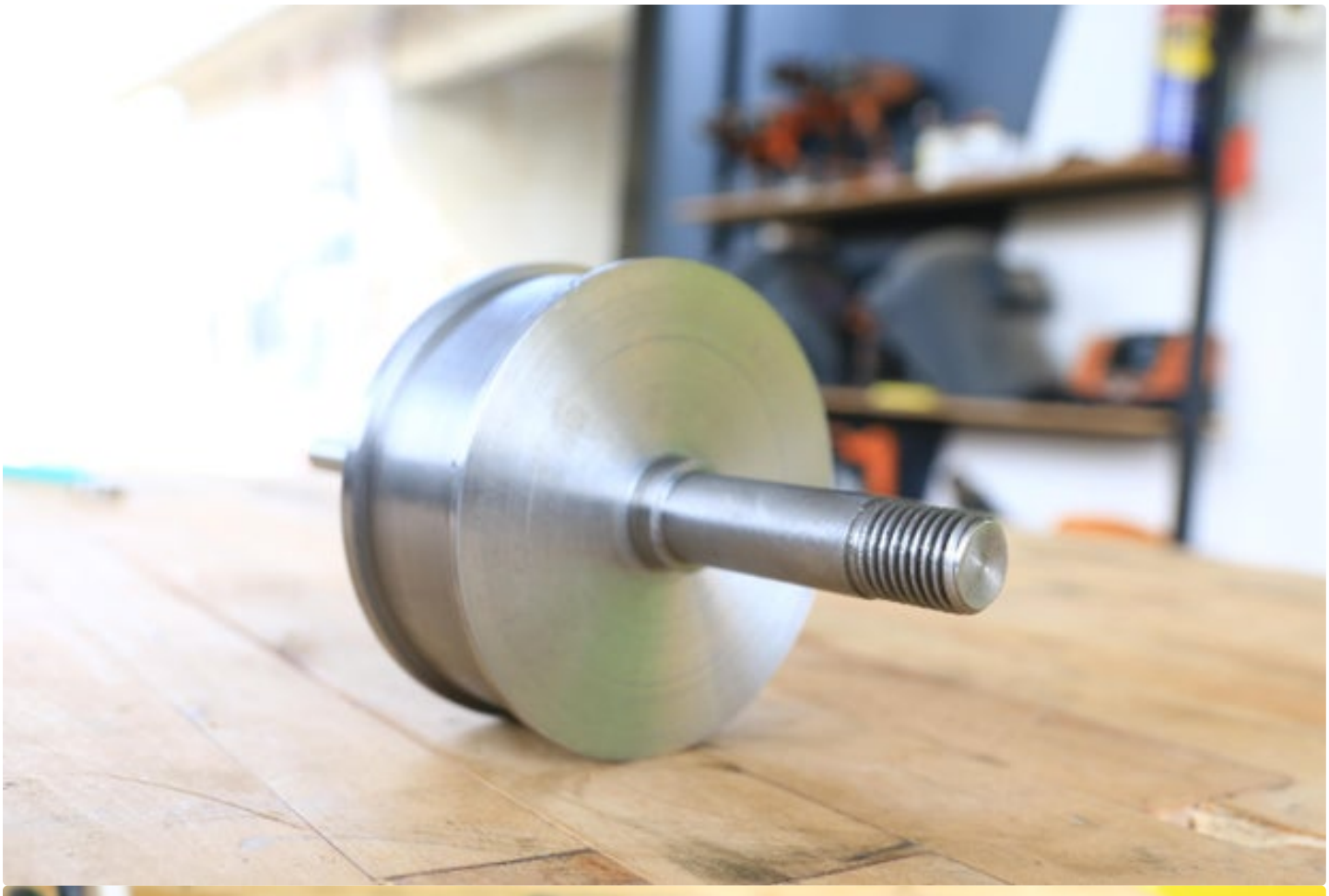


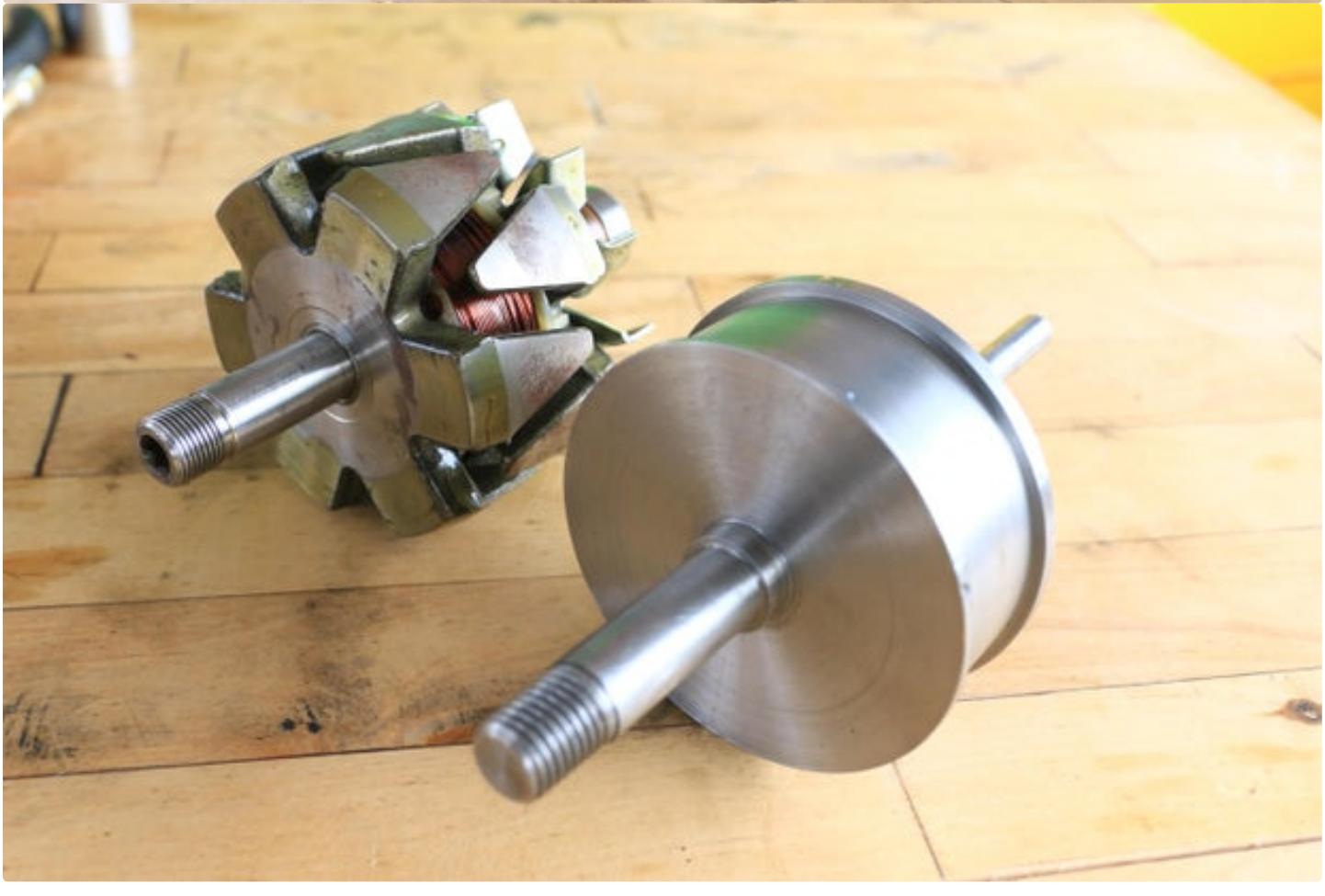


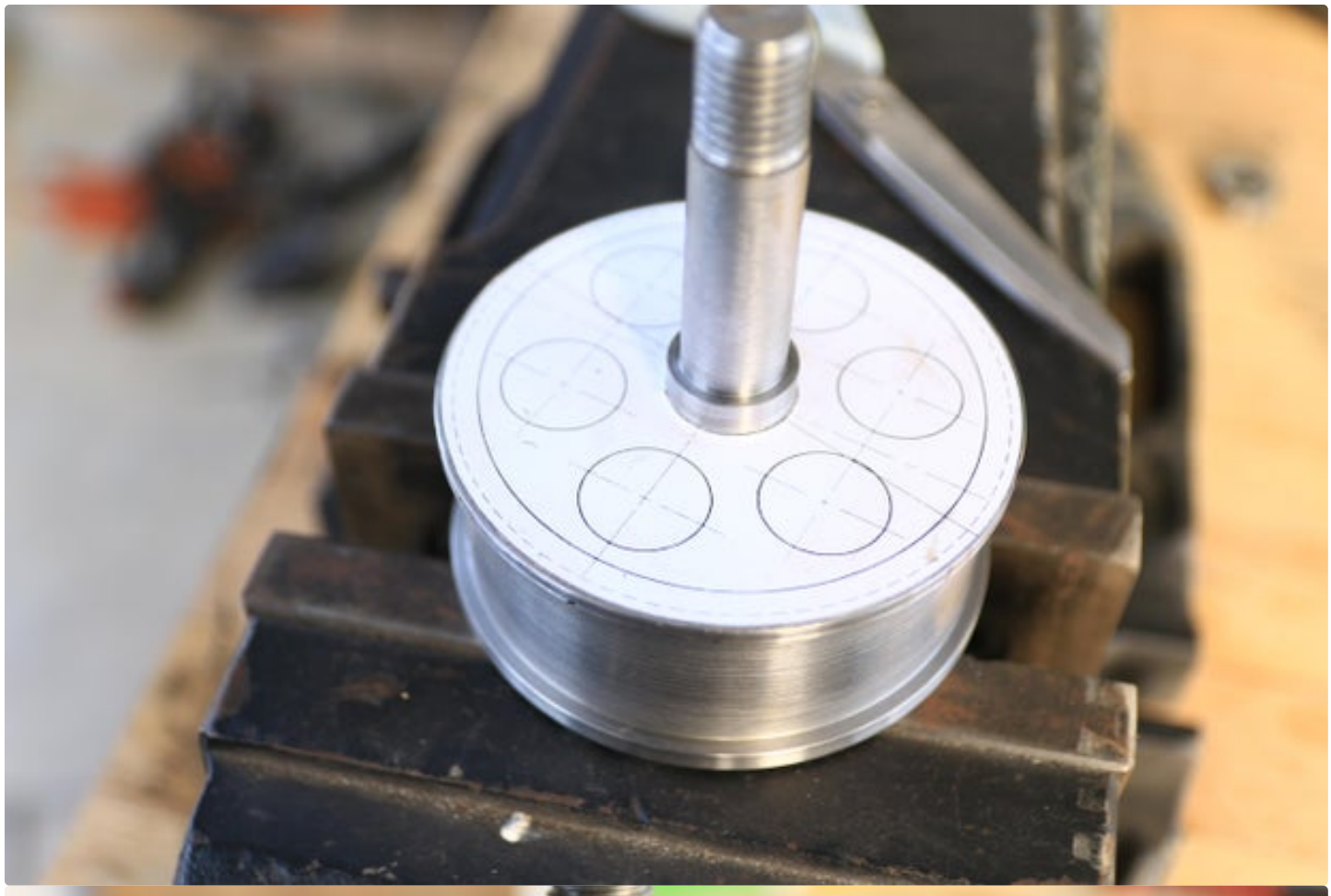








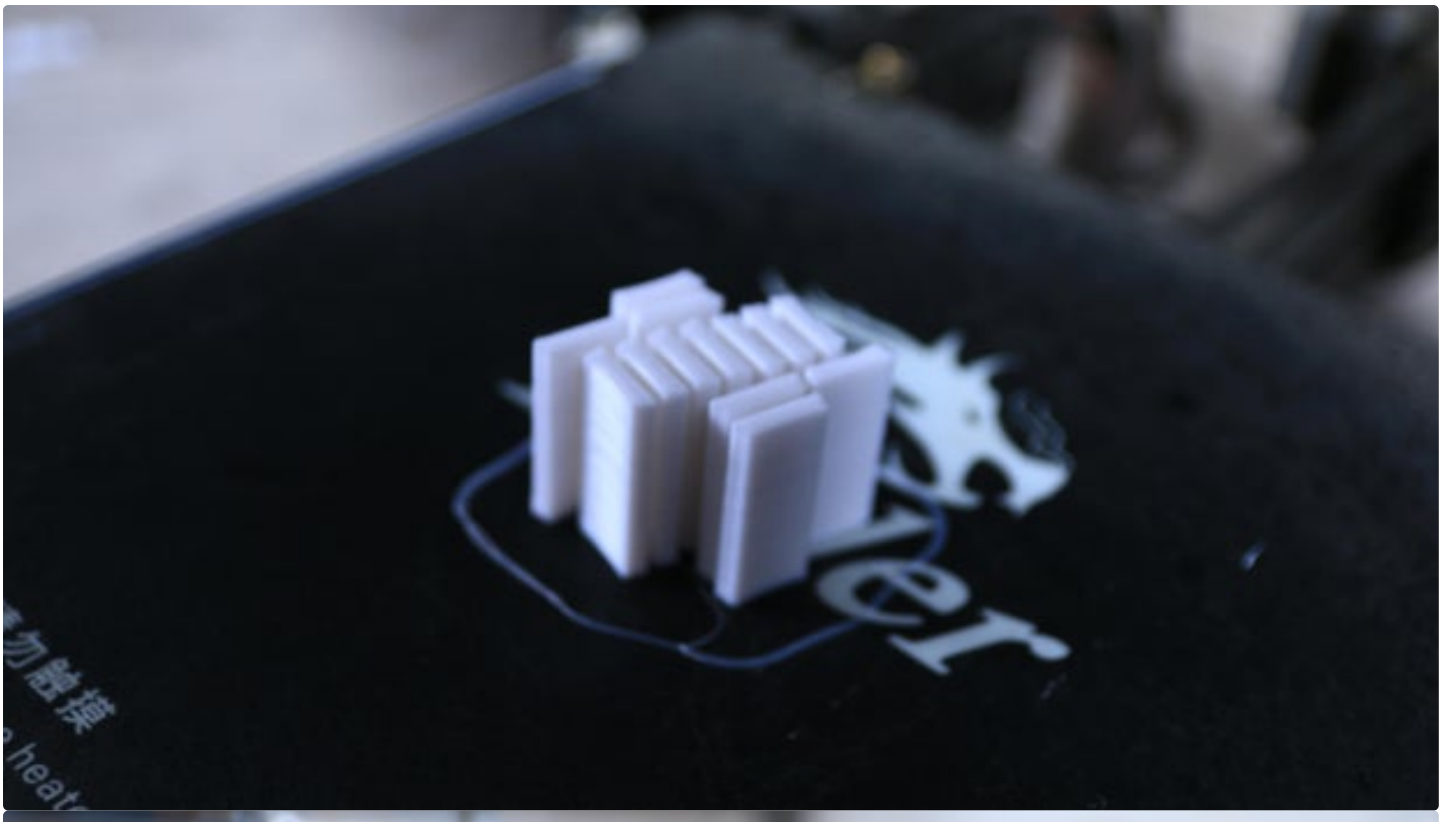




Step 3: Extracting the Neodymium Magnets

Thankfully the neodymium magnets we needed were exactly the same thats used in a brushless hub motor in a hoverboard. We have got a bunch of them laying arround so we poured one of the hubs with thinner to let the glue soften, this will later help us to salvage the magnets.

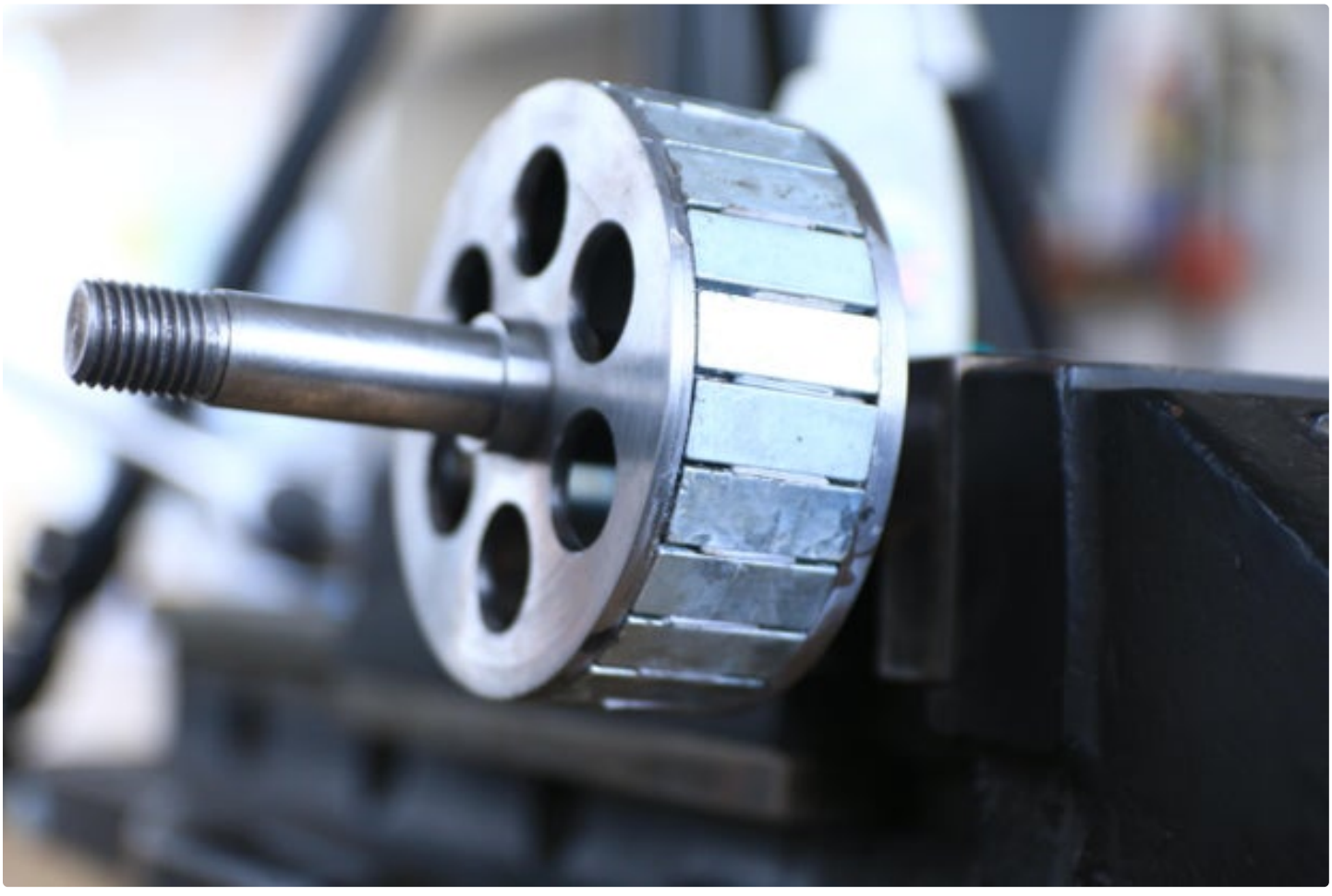
Later we salvaged the magnets, we need 24 of them. Now if you have noticed, the stock rotor has 12 alternating poles.

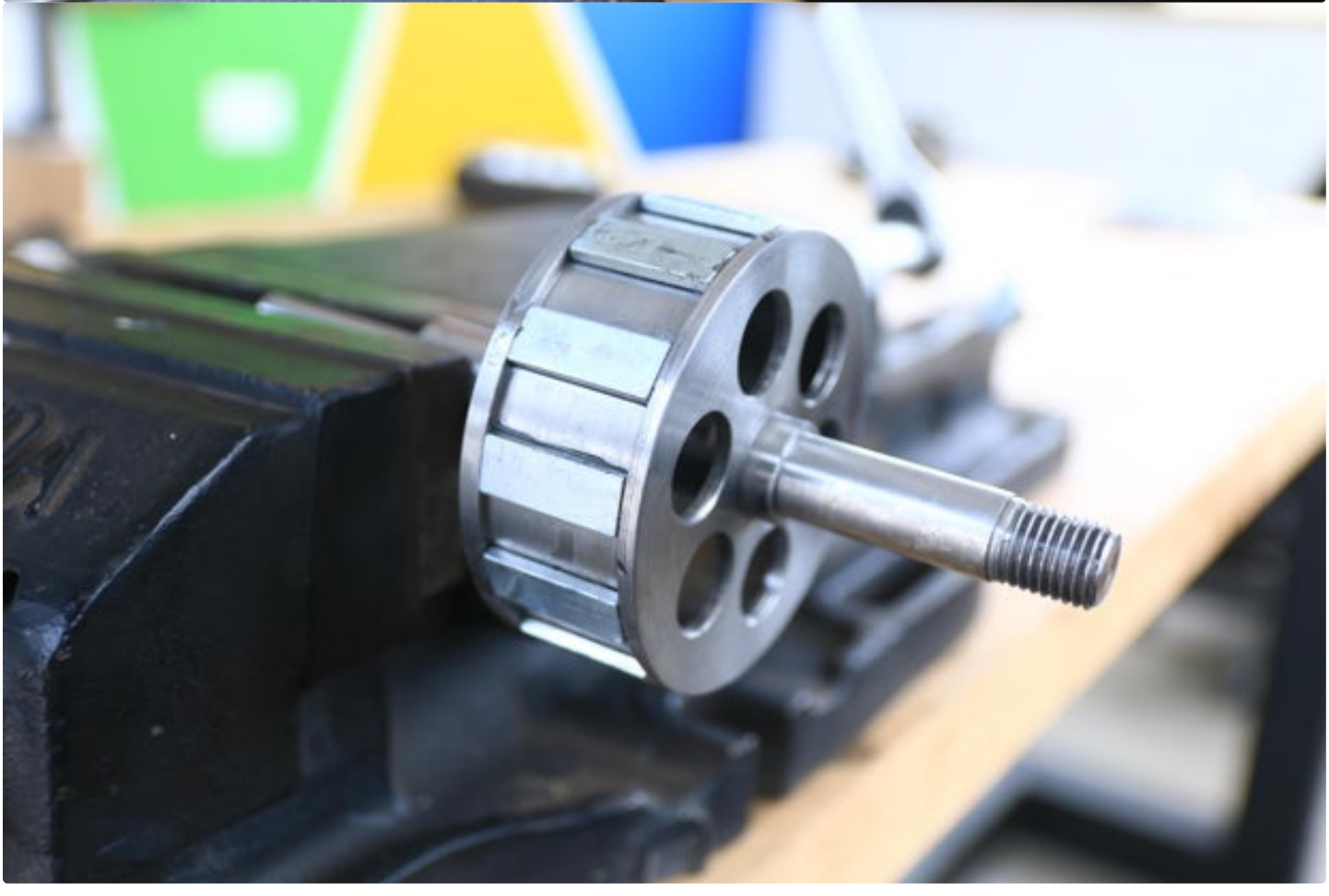


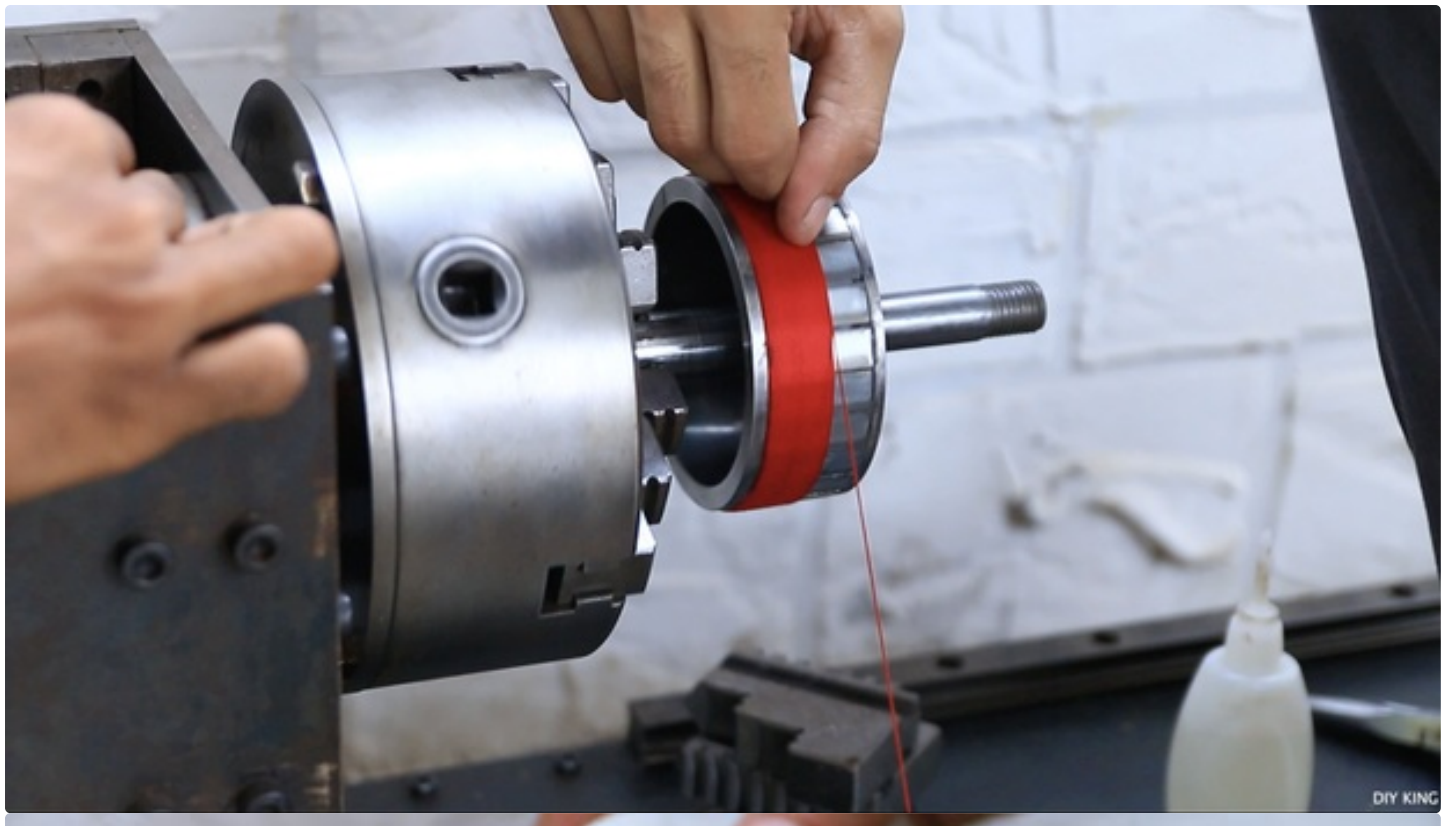
Step 4: Finishing the Rotor

Now if you have noticed, the stock rotor has 12 alternating poles. We are going to do the same with these magnets but in pairs so that we will cover the maximum avliable area on the rotor. We started gluing the magnets by spacing them using our 3d printed spacers making sure we place them with alternating poles. Later we glued the remaining magnets so that we have same poles on a pair and the next pair alternates.

The rotor is going to spin at 3 to 4000 RPM so leaving the magnets just with the glue there is a recipie for disaster. So we mounted the rotor to our beloved lathe, the project that never comes to an end anyways we applied two layers of thread. The right ingrident here is carbon fibre but we were unable to get that so fingers crossed.
Later we applied super glue over the tread to make it stronger and stick in place.



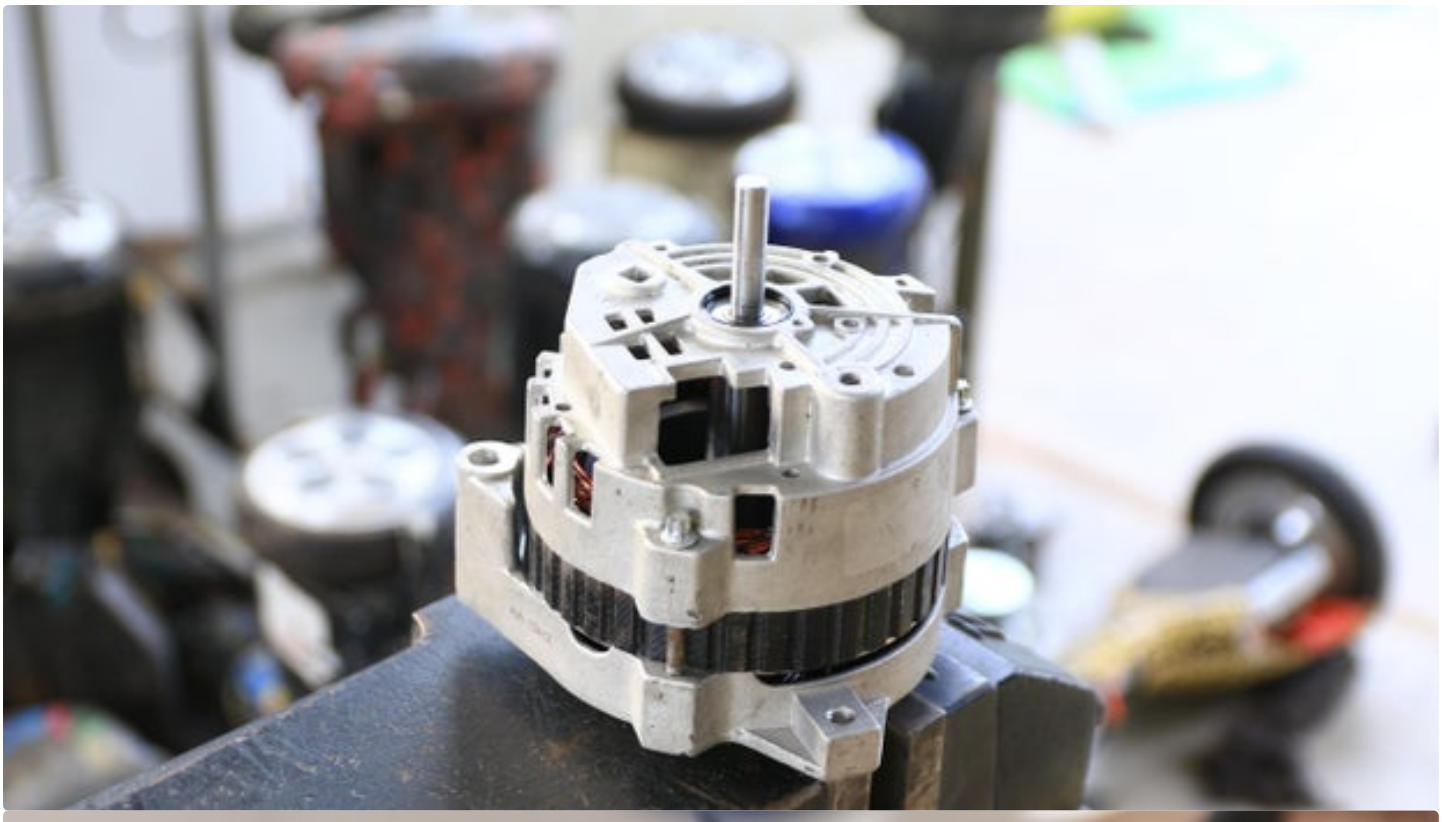


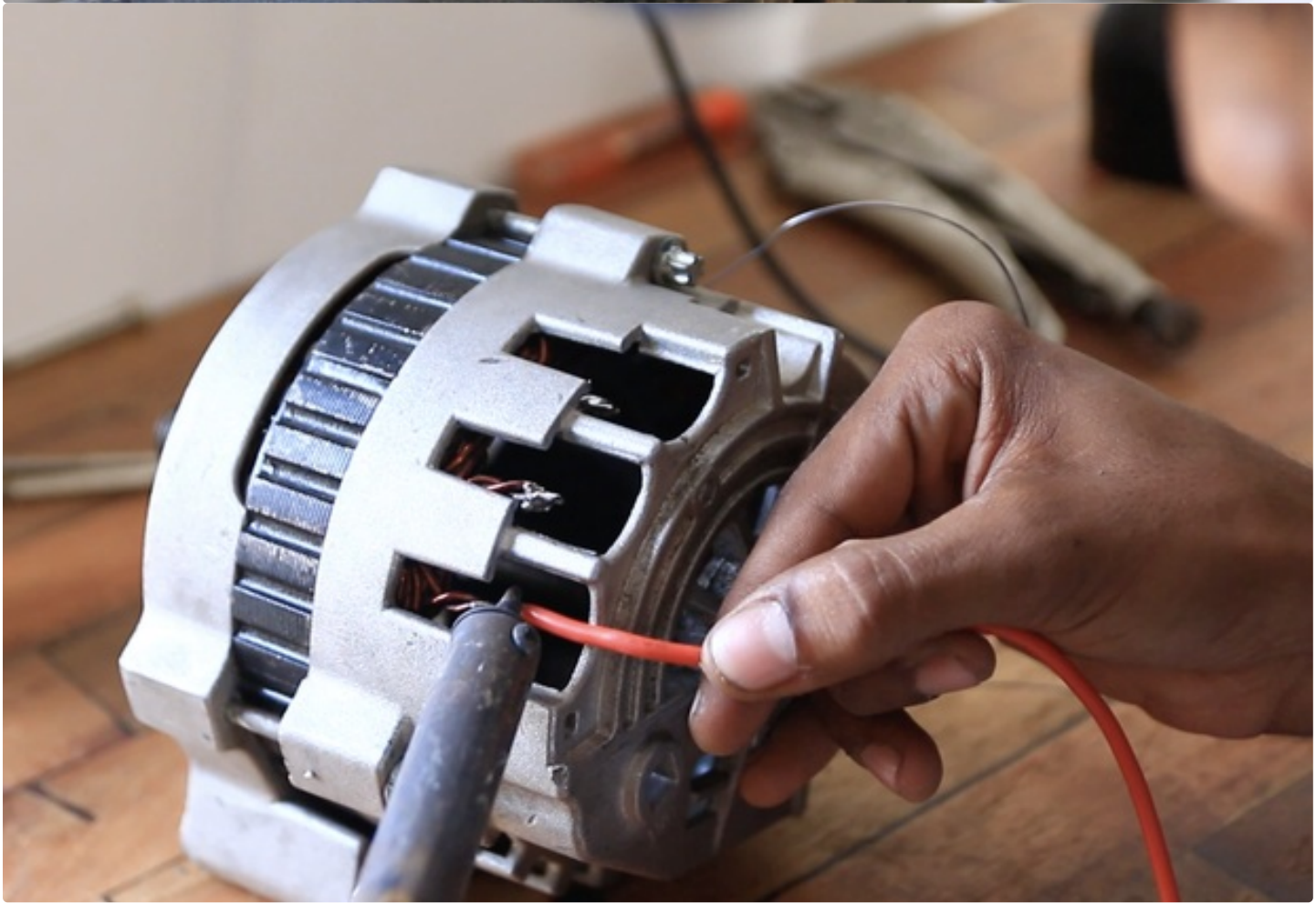


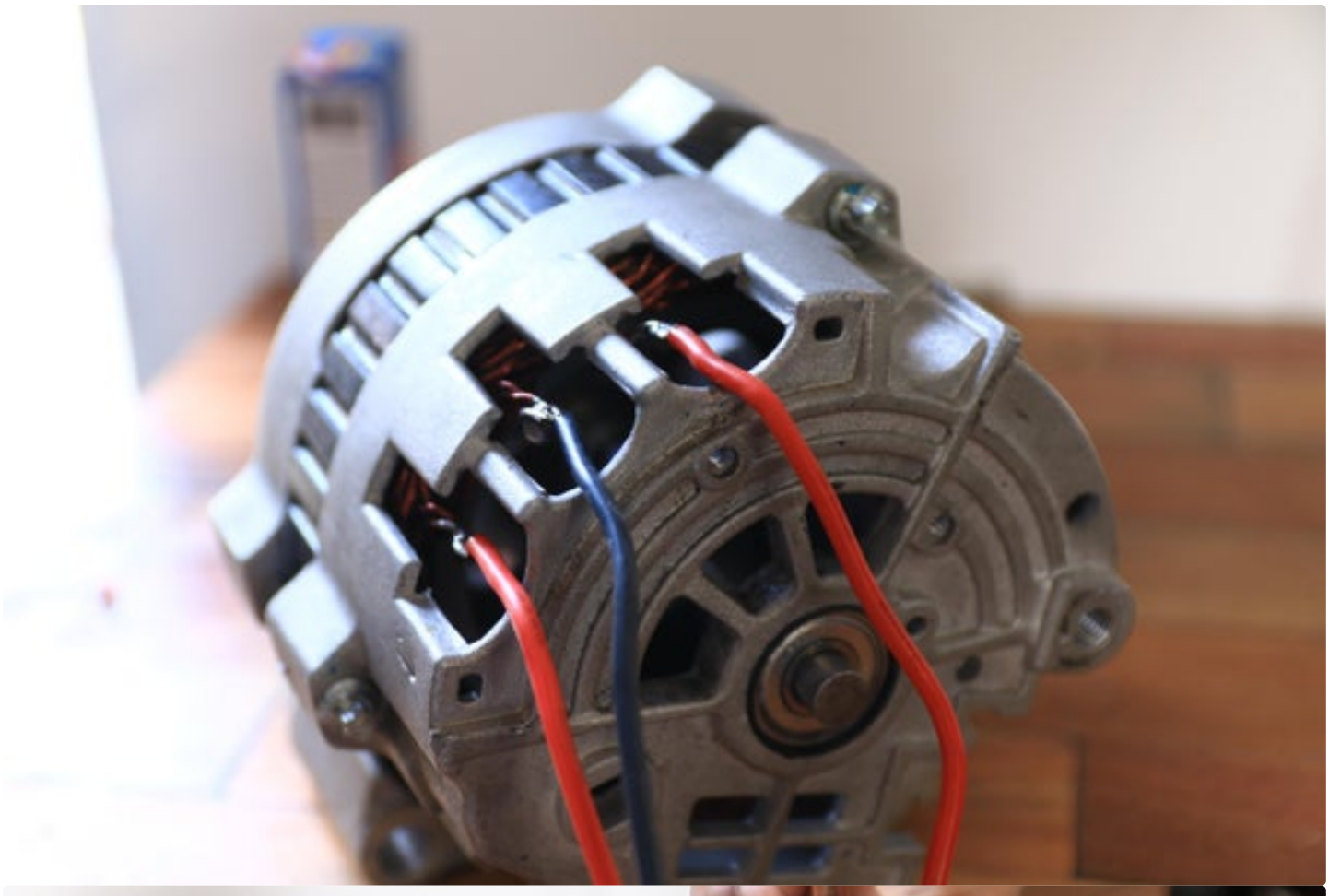
Step 5: Assembling Everything Back

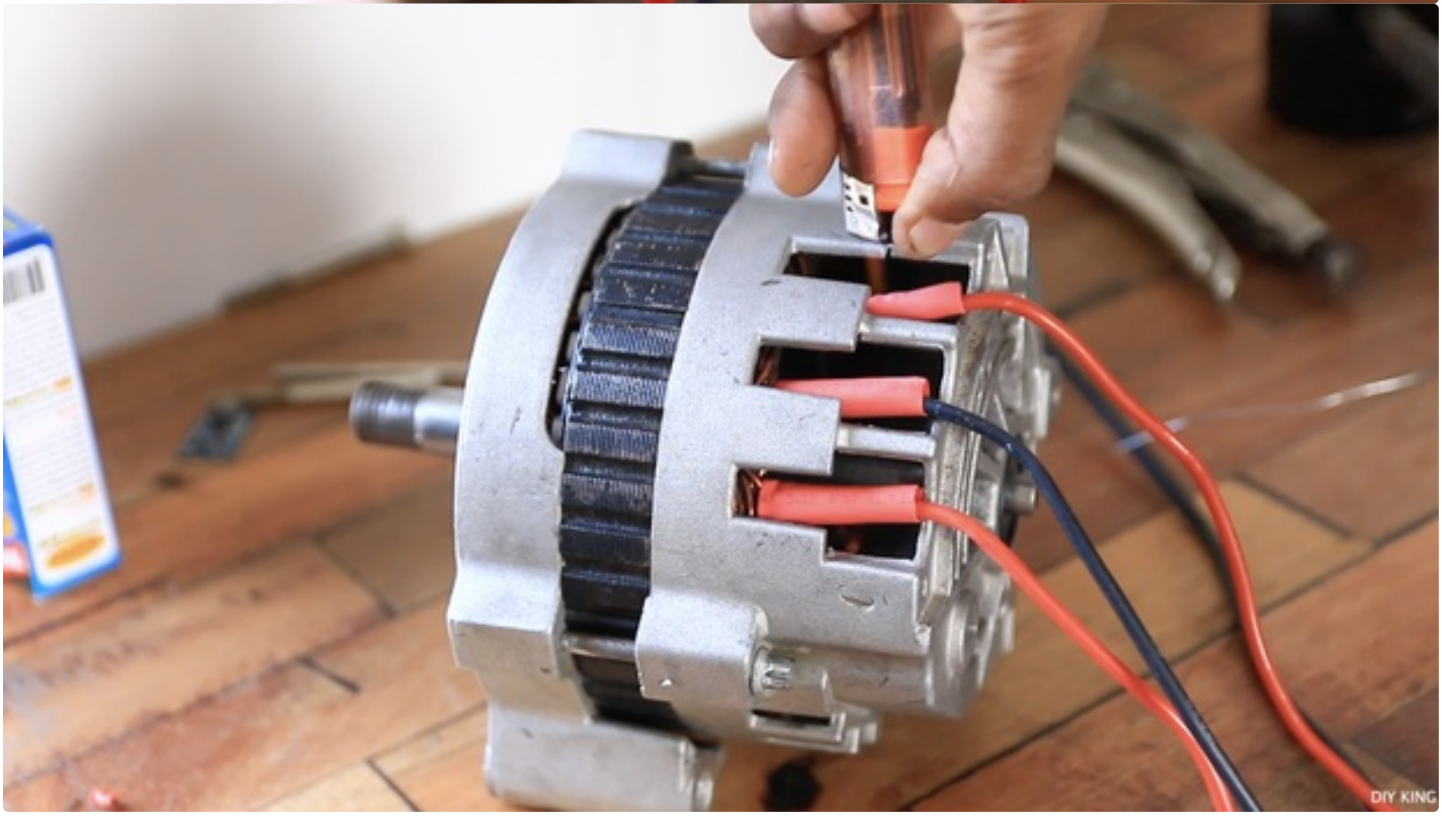
Once we are done with that it was time to assemble evrything together. These neodymium magnets are supper strong so we had to be really carefull working with them. Once the rotor in place we than tightend all the bolts. Now before we head to the test bench we sottered wires and connectors directly to the winding.

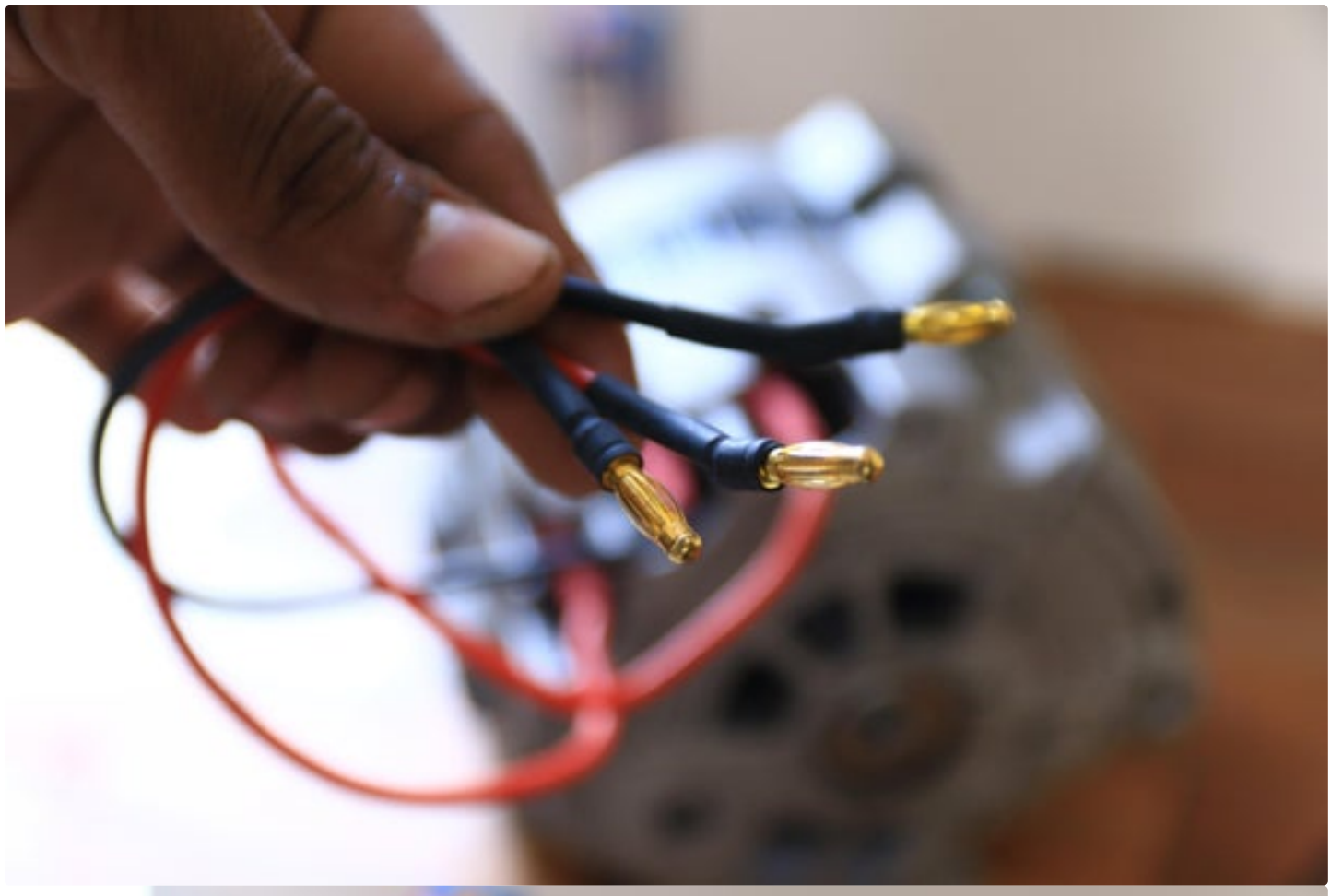
The alternator now weights 3kg so we trimmed down 2kg weight .Now thats great considering the fact that we dont have to deal with any inefficient parts.

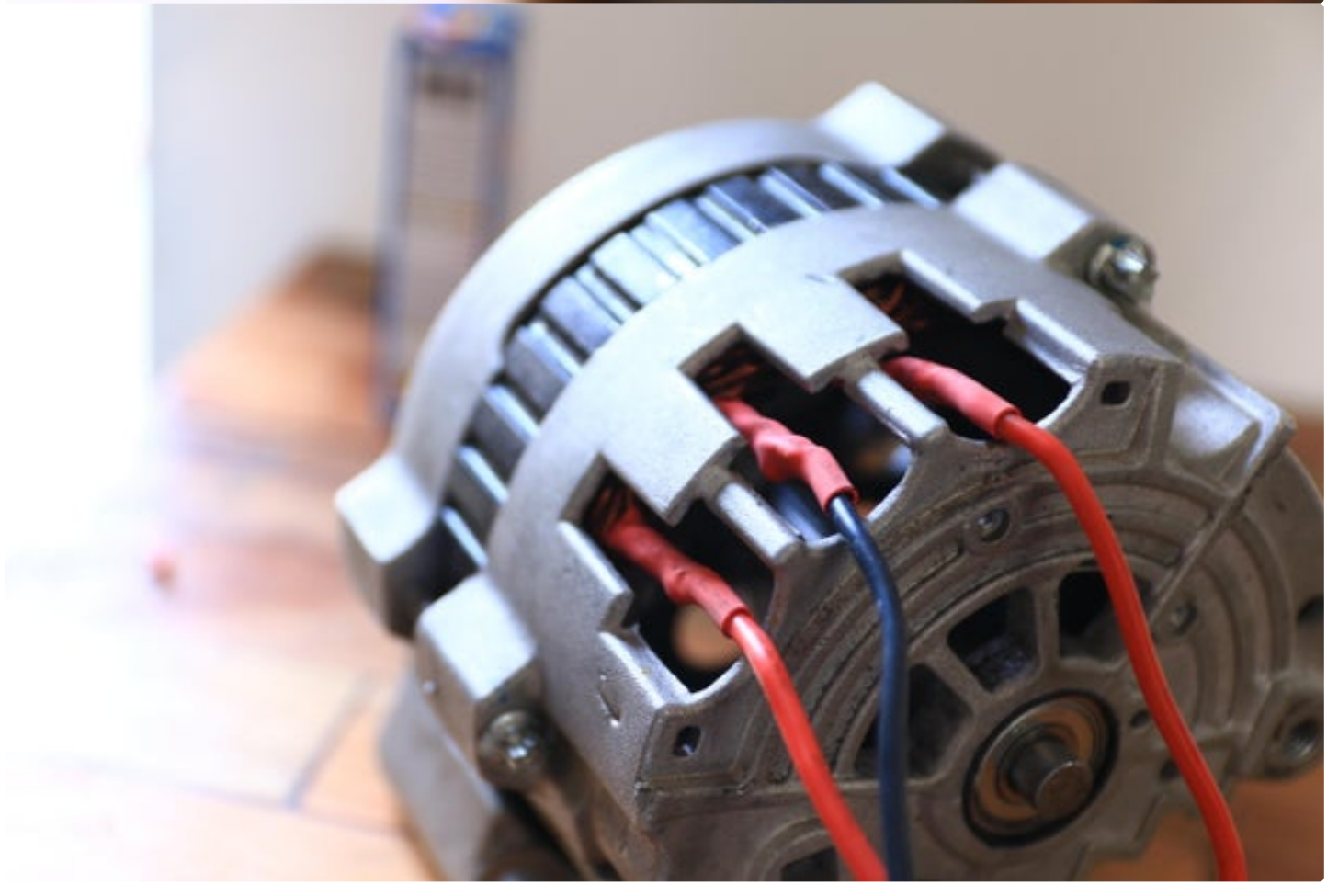




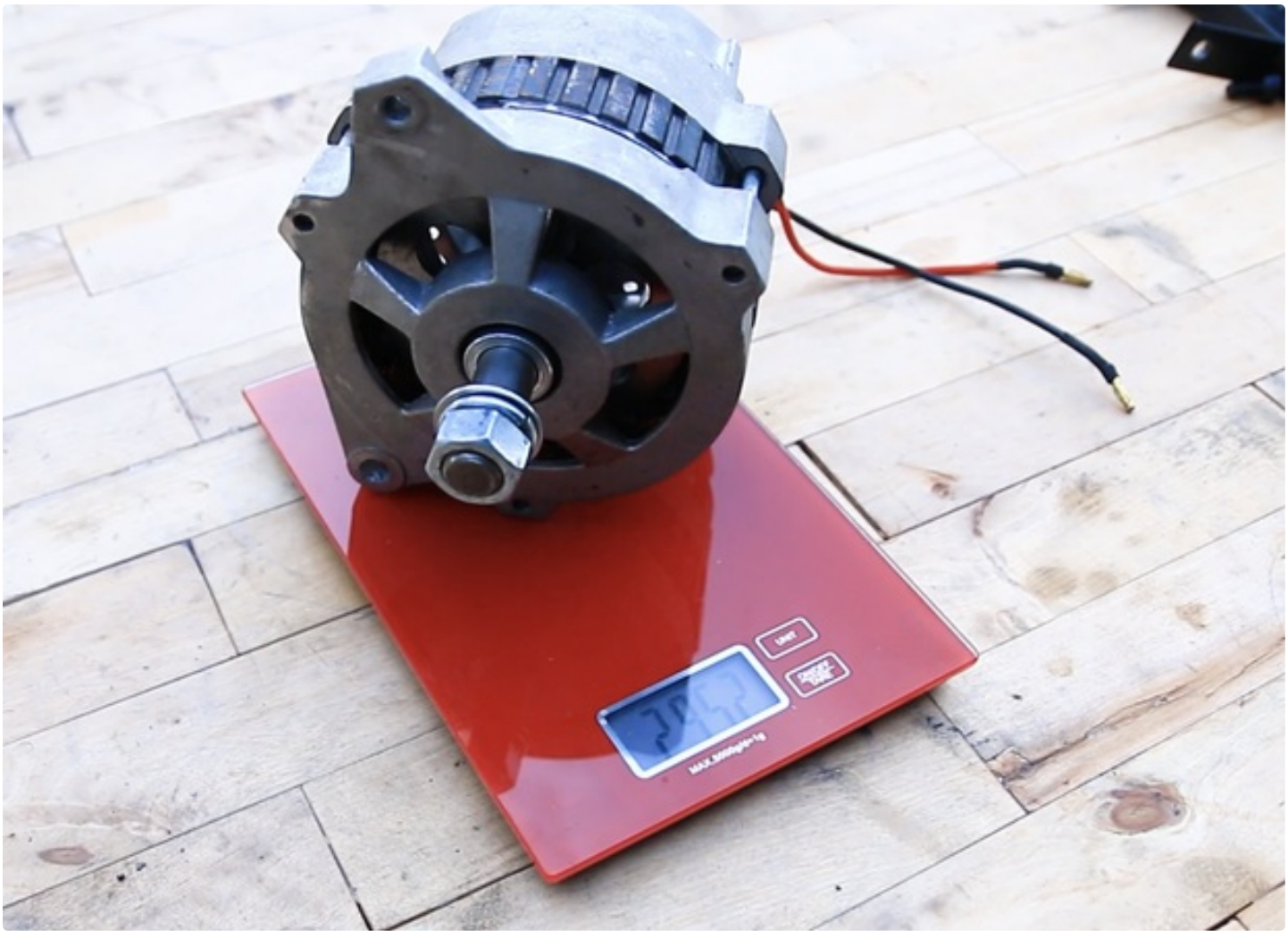








AC Generator Top Magnetic Generator Magnet Generator DIY



Step 6: Results

To test the amount of power it can generate we mounted the alternator to the vice. Spinning the rotor by bare hands is almost useless as this permanent rotor has lots of cogging and we barely get any output. So we used our impact wrench and it took arround 1200 RPM to light up a 12v bulb. Now is it good enough, well not yet.

Usually wind turbine spins at 700 RPM max and even if we use step up gearing, I doubt it will spin the rotor fast enough to produce reasonable amount of power. This might be resolved by using a 24v alternator and somehow decreasing the cogging effect but thats a subject for another project video.

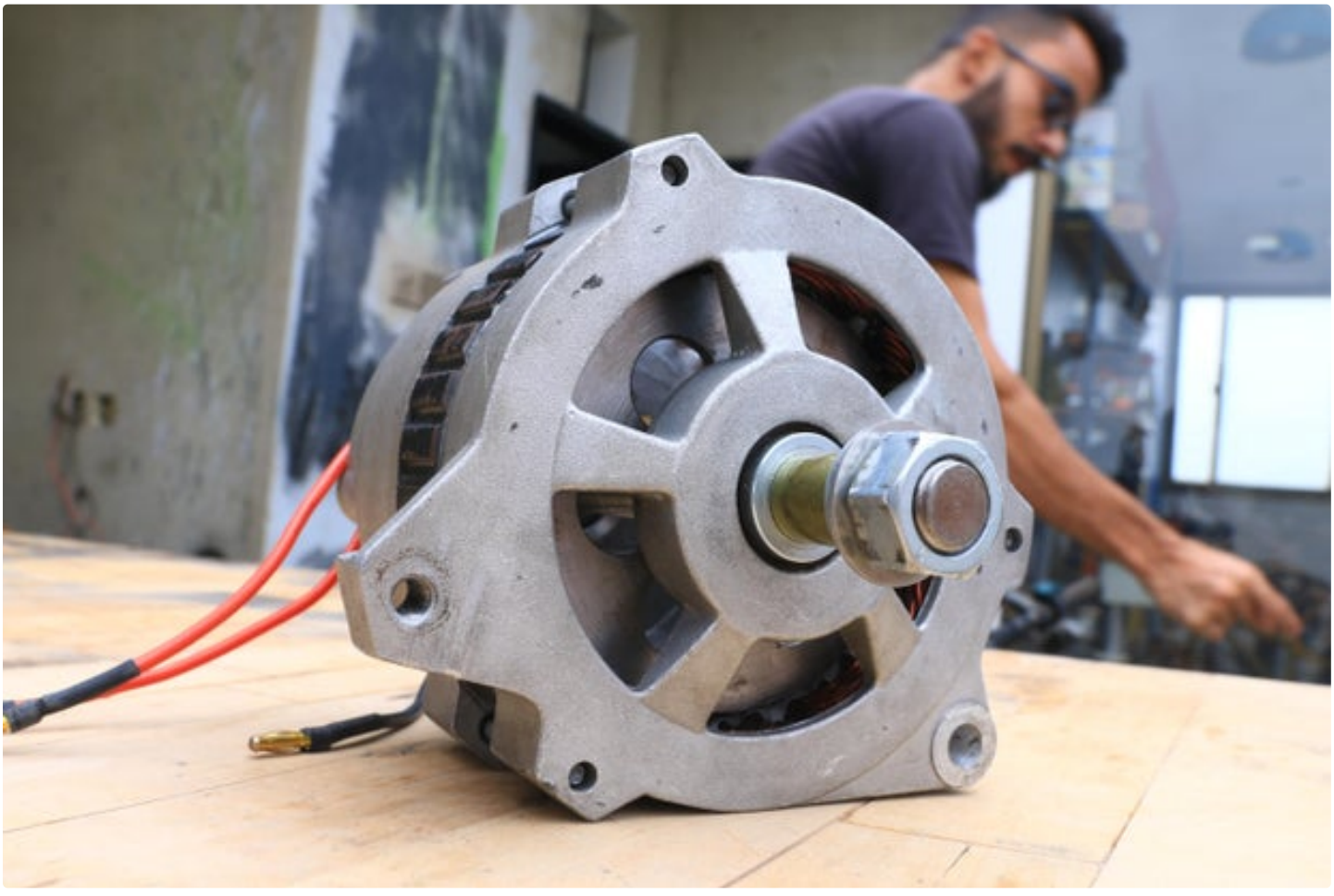
If this alternator needs to spin that fast, just to produce 12v imagine what it would be doing if we run this thing on 42v. Thats what we did next. No problem if its not a good generator at slow speed, it can be a powerful brushless motor. So the prop you see right there, Its 24in in diameter and have 12in pitch usually its driven by 60cc two stoke engines.

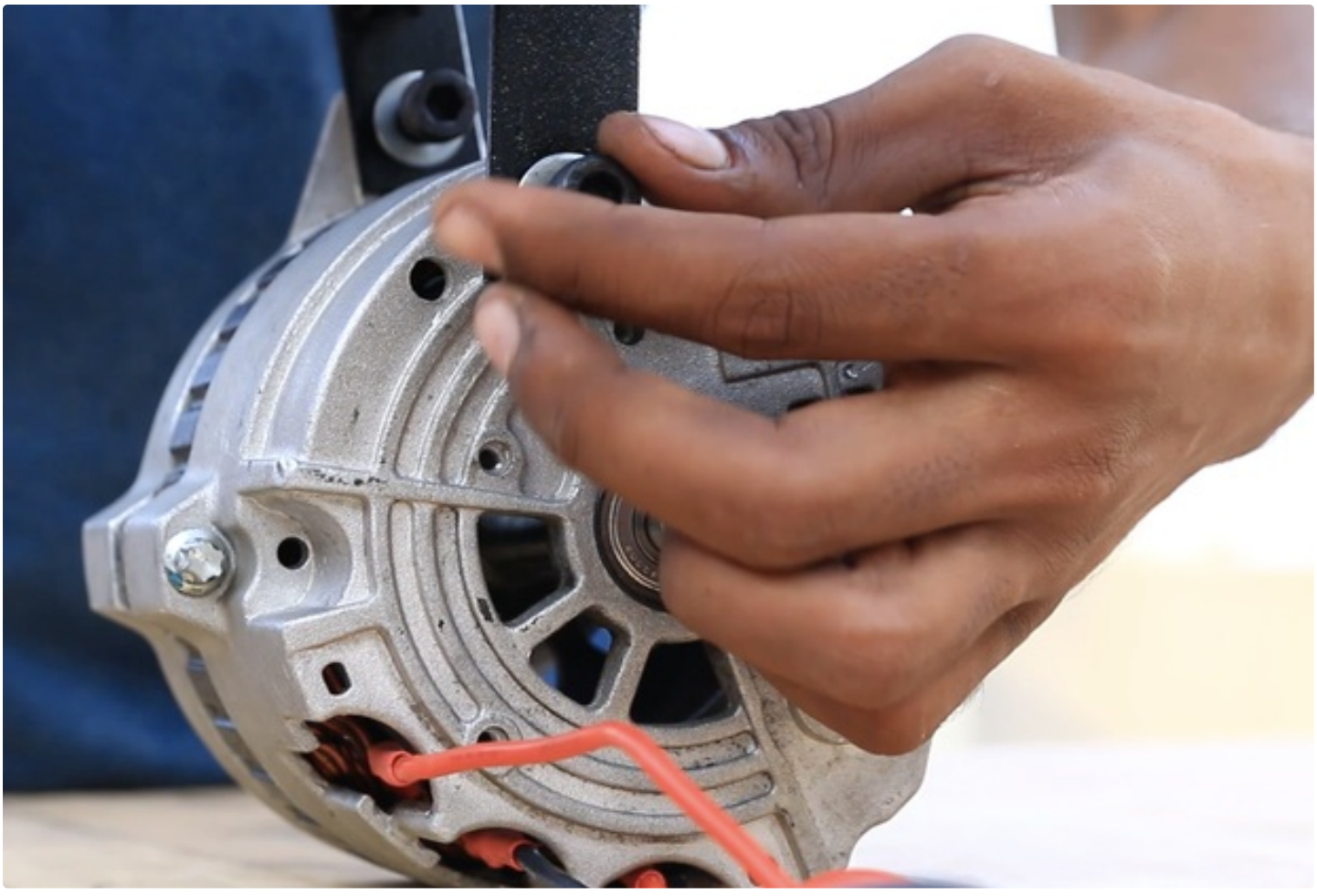
We spun the motor using a 10 cell battery pack thats nearly 42v so we expected nearly 4400 RPM but to our surprize we achieved 3300 RPM. The rotor is drawing 350 watts of power without load and this clearly indicates that there is something wrong in there. Thats a lot of power running the alternator without load as the same setup with the propeller mounted just added 600 watts of power drawing a total of nearly a thousand watts. The good thing is that witht the prop on the alternator achieved almost the same speed. Compared to the gasoline engine this thing offered instant power which is a great feature of electric power.

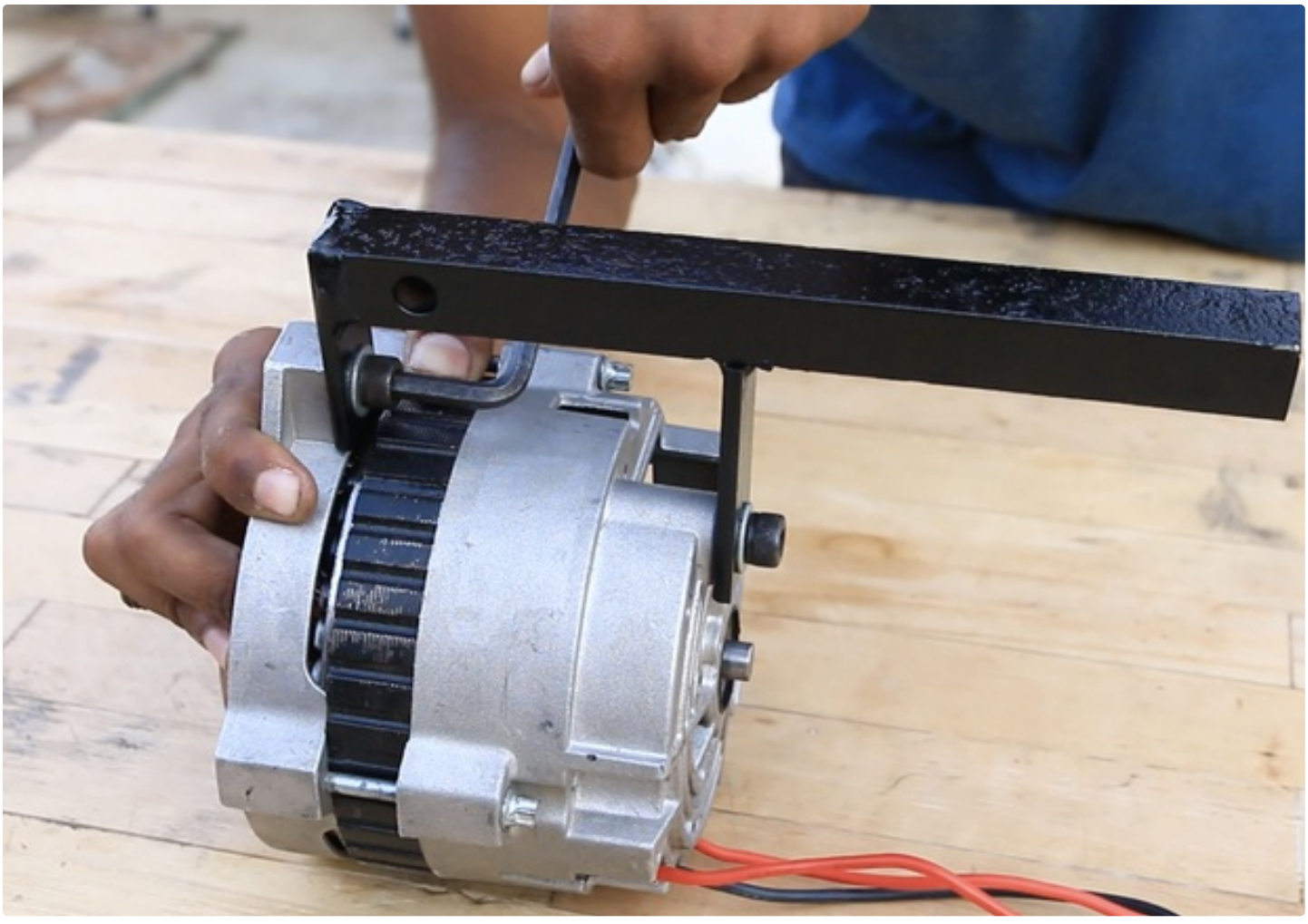
Its our first time converting a car alternator into something thats more useful for us one so we should call it sucess. We will try to find out the reason why is drawing so much power without load as everything is running smoothly without any

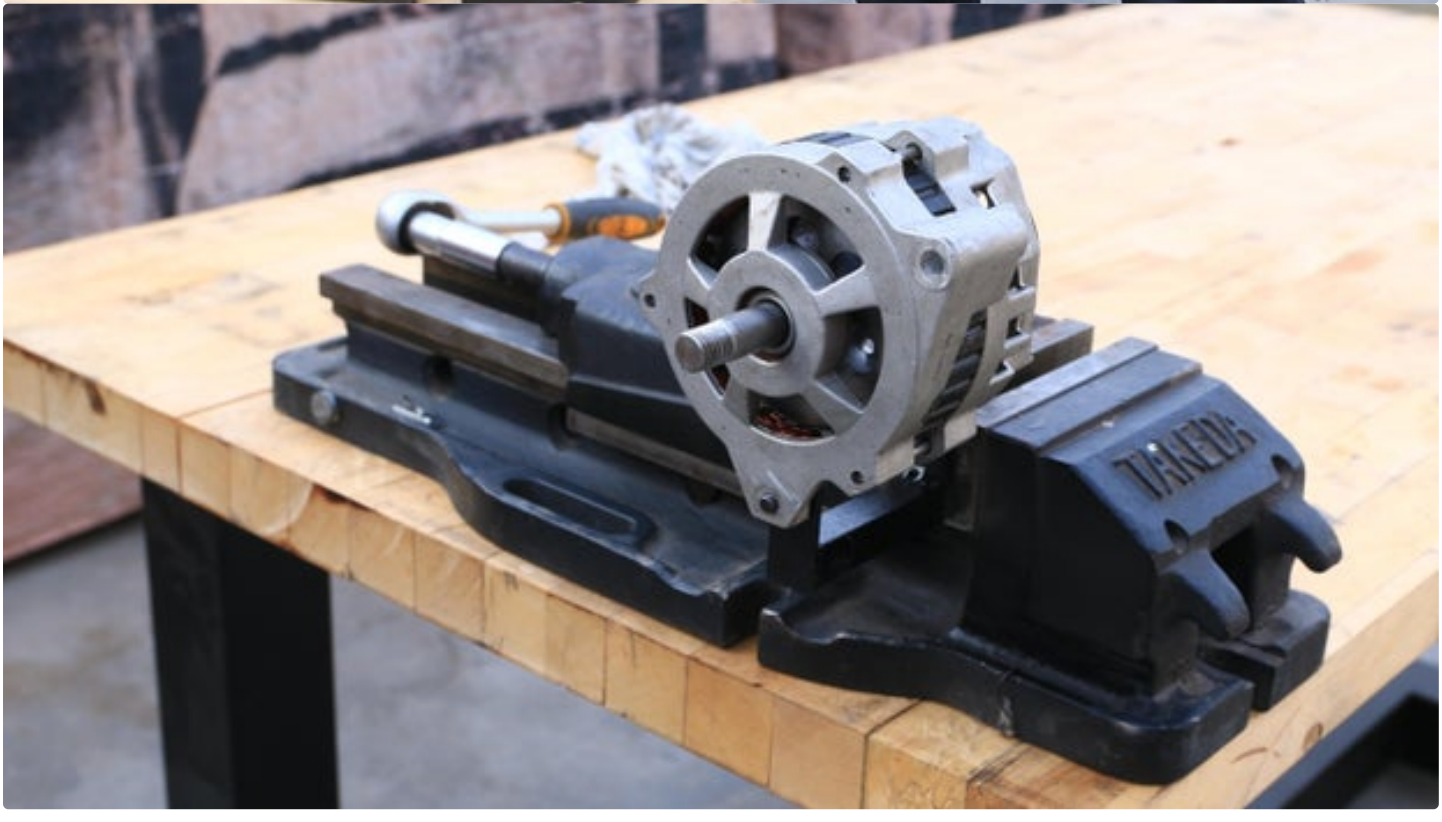
excessive viberation and this issue might be related to the width of the magnet poles on the rotor.

We are curious to see if a car alternator can be a powerful brushless motor and for that we are going to find out by converting our bicycle into an electric one. Stay tuned for that project.









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